A Population-Based Prospective Cohort Study Utilizing Administrative Data For The Analysis Of Self-Injury Among Depressed British Columbian Youth

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ABSTRACT

All persons aged 25 or younger between April 1991 and March 1992 who had been diagnosed as depressed and residing in British Columbia were included in the study. This cohort was divided into two groups: the first group (cases) contained all participants that self-injured at least once during the study period and the second group (controls) contained all individuals that did not self-injure during the study period. Administrative, census and parental administrative data were compiled for 10 years from the inception year and matched to each subject.

Among depressed youth, each physician visit involving a diagnosis of mental disorder or injury increased the risk of hospitalization for intentional self-injury by 1%. Residence in a local health authority where the average income of female lone parents is low increased the risk of self-injury by 69%. Each physician visit involving a diagnosis of musculoskeletal disorders decreased the risk of hospitalization for self-injury by 1%.

TABLE OF CONTENTS

List of Tables

List of Figures

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CHAPTER ONE: LITERATURE REVIEW

What is Suicide?

Suicide occurs when an individual intentionally takes his or her own life (Clarke, Frankish, & Green, 1997). Medical illness as a cause of death has decreased due to the increased efficacy of clinical medicine (Bell & Clark, 1998). This has resulted in intentional injuries, such as suicide, becoming a major contributing cause of death in youth (Bell & Clark, 1998).

Barrios, Everett, Simon and Brener (2000) describe suicide as being an endpoint of a continuum that starts with ideation, escalating into a planning and preparation phase and ending with the threatening, attempting and completion of suicide. According to the American Association of Suicidology, the five warning signs of suicide are: a suicidal threat or statement indicating intention or desire to die; previous suicide attempt; depression; change in behavior such as eating habits, sleeping patterns, inappropriate behavior, hyperactivity, substance abuse or risk taking behavior and finally, the act of making final arrangements (Jellinek & Snyder, 1998; Wiegersma, Hofman, & Zielhuis, 1999).

Barriers to the Collection of Suicide Data

The under-reporting of suicides has been estimated to be as high as 58% (Clarke et al., 1997). Misclassification is the major reason for the under-reporting of suicide and is due to suicides being classified as accidents, homicide induced suicides being classified as homicides, cultural and religious taboos, and incomplete medical files not stating the cause of death (Clark et al., 1997; Madge & Harvey, 1997). Other difficulties

encountered when collecting suicide data include lack of universally accepted criteria for determination of suicide, establishing intent with absolute certainty, and establishing ethnicity due to the ethnically diverse population (White & Rouse, 1997). Although often done with good intention, misclassification of suicide obscures the significance of suicidal behavior and impedes research in the field (Madge & Harvey, 1997).

Statistics used in national registered Aboriginal databases apply only to on-reserve treaty Aboriginals in seven provinces which accounts for less than one-third of all registered Aboriginals in Canada (Yang, 1986). This leads to serious under-representation of actual Aboriginal death rates and incorrect reporting of causes of death (Yang, 1986). The Federal Aboriginal Registry, which records deaths of registered Aboriginals who die on reserve, does not capture causes of death in its databases (Yang, 1992). Although it is generally accepted that very high suicide rates and general deprivation of longevity are endemic to our Aboriginal communities, Health and Welfare Canada, in its categorization of "mortality rates by cause, registered Aboriginal population, Canada", does not include suicide or homicide among its seventeen classifications (Frideres & Gadacz, 2001).

The Epidemiology of Suicide

Suicide is a major public health problem (Bell & Clark, 1998; Bloch, 1999). The rate of suicide among teenagers has risen over the past 35 years, to where it is now the third leading cause of death among adolescents in North America (Malchy, Enns, Young, Phil, & Cox, 1997; Wilkie et al., 1998). In British Columbia, young people under the age of 24 have shown the greatest increases in suicide rate (White & Rouse, 1997). Rapid psychological, biological and social changes during adolescence may increase

vulnerability to suicide risk factors (Chandler & Lalonde, 1998; Pelkonen & Marttunen, 2003).

a) Psychological Factors that Relate to Suicide

1. Psychopathology

Psychiatric disorders are the major risk factor for suicide (Bell & Clark, 1998; Schneider, Muller and Phillip, 2001; Stovall & Domino, 2003). Major depression is the most important risk factor for suicide and is associated with more than 50% of completed suicides (Jellinek & Snyder, 1998; Schneider et al., 2001; Stovall & Domino, 2003). A psychological autopsy is a retrospective clinical assessment of a deceased individual's life history, behavior, social and psychological features; it is based on existing reports and interviews with people who knew the deceased during life (Flisher, 1999; Pelkonen & Marttunen, 2003). Psychological autopsies reveal that diagnosable psychiatric illnesses are found in about 90% of all cases of suicide, and cases of suicide in the absence of a major mental disorder are so rare that it is argued that co-morbid psychopathology is a characteristic of death by suicide (Bell & Clark, 1998; Bloch, 1999; Jellinek & Snyder, 1998; Tondo & Baldesserini, 2000).

The presence of psychopathology increases the lifetime risk of suicide to a level 30 times higher than in the general population (Schneider et al., 2001). The mental disorders most often associated with suicide are: depression, anorexia nervosa, substance abuse, anxiety disorder, disruptive behavior disorder, schizophrenia and borderline personality disorder (Anderson, 1999; Baxter & Appleby, 1999; Brodsky, Malone, Ellis, Dulit, & Mann, 1997). The suicide rate among those with major depression was found to

be 20 times higher than that of the general population (Osby, Brandt, Correia, Ekborn & Sparen, 2001). Disruptive behavior disorders (i.e. conduct disorder) are associated with an increased risk of suicide of up to 6 times among youth (Pelkonen & Marttunen, 2003). Suicide accounts for 10% of deaths among patients with schizophrenia, making it the leading cause of premature death in this group (Radomsky, Haas, Mann & Sweeney, 1999). Rates of suicide among patients with borderline personality disorder ranges from 3% to 9.5% (Brodsky et al., 1997). It is believed that the trait of impulsivity seen in borderline personality disorder, rather than severity, is associated with suicidal behavior (Brodsky et al., 1997). Antidepressant treatments and psychotherapy have been associated with a reduction in suicidal acts (Jellinek & Snyder, 1998; Tondo et al., 1998). However, among suicide victims with major depression, only 46% had sought treatment from a mental health professional, less than a third had received treatment in their last year of life, and less than a quarter were being treated with antidepressants (Jellinek & Snyder, 1998; Miller & Druss, 2001). It must be noted that most persons with a mental illness do not commit suicide and other factors are involved (Stovall & Domino, 2003).

2. Developmental Psychopathology

Developmental psychopathology is a risk factor for suicide (Bell & Clark, 1998). This can develop through poor bonding in early infancy, the death of a parent during childhood, or other separation from close figures in a person's life (Bell & Clark, 1998; Runeson, 1998). Destructive coping mechanisms learned from parents such as a suicide attempt by a parent during the suicide victim's childhood may increase risk of suicide later in later (Runeson, 1998).

3. Suicidal Ideation

Roughly 1% to 2% of the total adolescent population has thought about suicide (Bloch, 1999). About 88% of people who have attempted suicide have reported prior suicidal thoughts, leaving 12% who have attempted spontaneously (Bloch, 1999). In fact, it is estimated that 50% of suicides are preplanned and at least two-thirds of suicides have communicated suicide predictive signs to friends and family (Paproski, 1997). A previous suicide attempt is a significant indicator that the patient will die by suicide in a subsequent attempt (Stovall & Domino, 2003). The greatest risk of completed suicide is within two years following an attempt and 20% of those who attempt suicide die by suicide (Stovall & Domino, 2003). Youth who attempt suicide have higher rates of psychopathology, adjustment disorders, and family problems than youth who have suicidal ideations but do not attempt suicide (Bloch, 1999). People who have completed suicide were found, through postmortem psychological profiles, to impulsively act out feelings of worthlessness (Bloch, 1999). Completers are also more likely than attempters to be diagnosed with bipolar disorder, to have a co-morbid affective disorder, to have firearms in their homes and are less likely to have received mental health treatment (Sanchez & Le, 2001). Chandler and Lalonde (1998) theorize that an individual's sense of continuity is a major factor in determining whether one will become suicidal or not. They report that psychiatrically hospitalized but non-suicidal adolescents were always able to reason why the person they once were and the person they are to become are the identical person; however, 84% of actively suicidal adolescents were unable to reach the same conviction (Chandler & Lalonde, 1998).

4. Life Dissatisfaction

Life dissatisfaction was associated with a higher risk of suicide (Koivumaa-Honkanen et al., 2001). Completed suicide is more strongly associated with hopelessness than depression (Bloch, 1999). Suicide victims had experienced more negative stressful life events than controls such as more difficulties in school, neither working nor being in school, and not going to college (Anderson, 1999; Bell & Clark, 1998). In British Columbia during 1994-1995, the most common stressors the year before suicide for those aged 24 and under who eventually died by suicide were interpersonal conflict, relationship breakup and academic problems (White & Rouse, 1997). Also in British Columbia, 70% of males and 68% of females who committed suicide in 1994-1995 were not living with an intimate partner at the time of death because they were either single, separated, divorced or widowed (White & Rouse, 1997). Suicide is also related to impulsivity shown in participation in injury-related risk behaviors such as driving without seatbelts, drinking and driving, carrying weapons, and engaging in physical fights (Barrios et al., 2000).

5. Substance Abuse

Alcohol use and drug abuse are high risk factors for suicide (Bell & Clark, 1998; Bloch, 1999; Stovall & Domino, 2003). Alcohol use has been associated with 50% or more suicides and increases the chance for suicide to a level 15 times greater than in the general population (Bell & Clark, 1998; Bloch, 1999). Substance abuse has been

estimated to account for 25% of all suicides (Stovall & Domino, 2003; Tondo & Baldessarini, 2000).

b) Biological Factors that Relate to Suicide

1. Gender

Males are more likely than females to complete suicide (Anderson, 1999; Bloch, 1999; Clark et al., 1997; Jellinek & Snyder, 1998; Stovall & Domino, 2003). In British Columbia the male suicide rate is 20.8 per 100,000 while the female rate is 6.4 per 100,000 (Clark et al., 1997). Women attempt suicide more often than men, but by less-lethal means (Bloch, 1999; Jellinek & Snyder, 1998; Stovall & Domino, 2003). Also, males have a much higher degree of substance abuse than females, which is a significant indicator of high suicide risk (Bloch, 1999). In British Columbia during 1994-1995, of youth aged 20-24, 43% of male suicides were intoxicated compared to 32% of female suicides at the time of suicide (White & Rouse, 1997).

2. Sexual Orientation

Sexual orientation has emerged as a suicide risk factor (Russell and Joyner, 2001). Sexual minority youth are more than twice as likely as heterosexual youth to think about and attempt suicide (Russell & Joyner, 2001). This may be due to the depression caused by difficulties in dealing with the stigma of homosexuality during young people's lives (Russell & Joyner, 2001).

3. Genetics

Genetic factors play a significant role in risk of suicide (Bell & Clark, 1998). Monozygotic twins exhibit a significantly higher occurrence of suicide in both twins than among dizygotic twins (Bell & Clark, 1998). Also, studies of adopted children reveal that the relatives of adoptees who committed suicide have committed suicide at significantly higher rates than have relatives of adoptees who have not committed suicide (Bell & Clark, 1998).

4. Other Biological Factors

Other biological factors such as low cerebrospinal fluid (CSF) 5-HIAA levels have been associated with impulsivity and violent suicide attempts (Bell & Clark, 1998). Increased suicide rates occur in patients with significant medical illnesses such as cancer, human immunodeficiency virus infection, seizure disorders and chronic pain (Stovall & Domino, 2003). Postmortem studies estimate physical illness to be a contributing factor in 11% to 51% of suicides, with the percentage increasing with age, physical illness is present in 25% to 75% of suicide victims (Bell & Clark, 1998; Stovall & Domino, 2003).

c) Social Factors that Relate to Suicide

1. Rurality

Clark et al. (1997) describe suicide as being the result of a three stage process, beginning with a history of problems throughout childhood and adolescence, which may lead to an escalation of the problems during adolescence, that may result in a rapid breakdown of contacts with family and peers leading to social isolation. Social isolation can be considered a measure of the social environment or determined at an individual

level by such measures as living alone and absence of social support (Singh & Siahpush, 2002). Social isolation is a major suicide determinant (Singh & Siahpush, 2002; Stovall & Domino, 2003). Suicide rates vary inversely with the degree of integration into social groups (Clark et al., 1997; Stovall & Domino, 2003). Rurality is an example of a measure of social isolation (Sing & Siahpush, 2002).

Higher suicide rates in rural areas compared to urban areas have been found in the United States, Australia, Scotland, Greece, Sweden and Canada (Cantor & Coory, 1993; Clayer & Czechowicz, 1991; Rost, Zhang, Fortney, Smith, & Smith, 1998). Possible reasons for comparatively higher suicide rates in rural areas are the physical and social isolation and limited opportunity for social interaction and networking (Singh & Siahpush, 2002). Also, a number of other societal factors present in some rural areas, such as declining population due to the unfavorable changes in socioeconomic and industrial activity, make already restricted employment opportunities increasingly limited, especially for young people (Baume & Clinton, 1997; Sing & Siahpush, 2002). Rost et al. (1998) have found that individuals in rural areas have comparable levels of psychiatric disorders to those seen among their urban counterparts but have less access to mental health professionals on both an absolute and per capita basis due to rural shortages in mental health professionals. Structural factors that may also contribute to increased suicide rates among rural youth include unemployment, inappropriate media representations of suicides, barriers in accessing and utilizing mental health services, and increased access to lethal methods of self-harm (i.e., guns) in rural communities (Baume & Clinton, 1997).

2. Socioeconomic Environment

The socioeconomic environment has an influence on population levels of suicide; areas of high socioeconomic deprivation have increased suicide rates (Hawton, Hariss, Hodder, Simkin & Gunnell, 2001). Social factors such as anomie are risk factors for suicide (Clayer & Czechowicz, 1991). Anomie is social instability caused by an erosion of standards and values and may cause suicidal behavior when the relationship between an individual and society is broken down by social or economic adversity, causing social isolation and alienation (Bell & Clark, 1998). The rate of suicide is directly related to the unemployment rate (Gessner, 1997; Hawton et al., 2001). Also, there is a strong association between social fragmentation and suicide (Hawton et al., 2001).

3. Family

It was found that 41% of males and 33% of females who complete suicide have first or second degree relatives who had previously attempted or committed suicide (Baume & Clinton, 1997; Runeson, 1998; Stovall & Domino, 2003). Other characteristics associated with the suicide victim's family include a non-intact family of origin, less frequent or satisfying communication with the parents, lower levels of education, more household occupants, domestic violence, death of parent or sibling, alcohol abuse in one or both parents, a mother with a history of mood disorder symptoms, and a father with a history of trouble with the law (Anderson, 1999; Bell & Clark, 1998; Bloch, 1999; Jellinek & Snyder, 1998; Kosky, Silburn, & Zubrick, 1990; Runeson, 1998; Stovall & Domino, 2003; Wilkie et al., 1998). If a suicide occurs, the significance of family turmoil

increases because it contributes to the already negative situation that may lead to further suicides in the same family or in neighbouring communities (Baume & Clinton, 1997).

4. Aboriginal Factors

Suicide rates vary across different cultural groups but are much higher for Aboriginal groups in Canada than any other population segment (Clayer & Czechowicz, 1991; Ferry, 2000; Malchy, 1997; Wilkie et al., 1998). As in Paproski's study (1997), this study will use the term Aboriginal to refer to any person who, by treaty or non-treaty status or by ancestry, derives from an indigenous tribal group. In British Columbia, the suicide rate for the general population is 13.5 per 100,000; for Status Aboriginals it climbs to 48.8 per 100,000 (Clark et al., 1997). However, suicide rates can be up to 23 times higher in Aboriginal Canadians than in comparable non-Aboriginal groups (Wilkie et al., 1998). Aboriginal suicide rates among the 15-24 year age group are increasing at a faster rate than among any other age group (Clark et al., 1997; Paproski, 1997). British Columbia statistics for 1989 indicate that, 20% of suicides occurred in the non-Aboriginal population under the age of 25 years while 42% of suicides occurred in the Aboriginal population under the age of 25 years (Clark et al., 1997). Despite making up only 3% of the total British Columbia population in 1991, Aboriginals accounted for 6% of the suicides (White & Rouse, 1997).

The most frequent means of committing suicide among Canadian Aboriginals are firearms and drugs, and among the Inuit they are hanging and firearms (Clark et al., 1997; Malchy et al., 1997). The movement from tribal to urban settings has had a large impact on traditional behavior (Clayer & Czechowicz, 1991; Ferry 2000, Malchy et al., 1997).

The disruption of traditional Aboriginal culture led to a lack of social integration in Aboriginal adolescents because they are not a part of tribal culture or a part of mainstream culture (Clark et al., 1997). As a result, Aboriginal youth may develop difficulty in developing self-esteem, personal identity and cultural identity (Paproski, 1997). "Anomie" is the term used to describe the social disintegration affecting tribal peoples under colonization (Clayer & Czechowicz, 1991). In Aboriginal culture, elders are the caretakers of traditional knowledge and culture (Wilkie et al., 1998). The link between disruption of traditional Aboriginal culture and increased suicide rates is illustrated in research that shows that British Columbian Aboriginal communities with fewer elders have high rates of suicide (Wilkie et al., 1998). Other factors that increase the risk that an individual of Aboriginal descent will commit suicide that are common with the general population are: poverty; alcohol abuse; access to firearms; loss of one or both parent to death, divorce or separation; adoptive or foster child status; experience of sexual or physical abuse; lack of familial support; parental or immediate family drug use; parented by diverse caretakers and generally increased levels of familial disruption (Clark et al., 1997). A correlational analysis conducted by Lester (1996) found that American Aboriginal suicide rates and homicide rates, unlike those of non-Aboriginal American population, were not affected by unemployment rates.

The degree of self-governance seems to have the greatest protective effect on Aboriginal suicide rates (Chandler & Lalonde, 1998; Ferry, 2000). Canadian Aboriginal bands without self-governance had a youth suicide rate of 121.0 per 100,000 while bands with some degree of self-governance had a mean youth suicide rate of 18.2 per 100,000 (Ferry, 2000). However, in British Columbia, the suicide rate of Aboriginal people who

live on reserves is higher than the suicide rate of Aboriginal people who live off reserves (Malchy et al., 1997). In British Columbia, Aboriginal communities that are trying to exert control over their traditional land base have substantially lower suicide rates of 86.8 per 100,000 compared to 147.3 per 100,000 in communities that are not trying to exert control of their traditional land (Chandler & Lalonde, 1998). Communities where the majority of children go to band controlled schools have a suicide rate of 71.1 per 100,000 while communities where this is not the case have a suicide rate of 116.2 per 100,000 (Chandler & Lalonde, 1998). Communities that have some control over provision of health care have suicide rates of 89.0 per 100,000 while communities where this is not the case have suicide rates of 125.1 per 100,000 (Chandler & Lalonde, 1998). Suicides were reduced from 128.7 per 100,000 in communities that did not contain cultural facilities to 99.4 per 100,000 in communities that did (Chandler & Lalonde, 1998). The final protective factor for British Columbian Aboriginal populations seemed to be control over the police and fire services; communities that had control experienced a suicide rate of 99.4 per 100,000 while communities that had no control experienced suicide rates of 128.7 per 100,000 (Chandler & Lalonde, 1998).

Suicide Epidemics

According to Gould, Shafer, Fisher and Garfinkel (1998), suicide epidemics have been reported from ancient times to the 20th century. A suicide cluster can be defined as 3 or more linked suicidal events in a continuous space and time frame (Wilkie, MacDonald & Hildahl, 1998). Gould, Wallenstein and Kleinman (1990) have found that clustering of teenage suicides occur to an extent that is significantly greater than would be expected by

chance variation. Time-space clustering of suicides is more significant among adolescents and young adults with a minimum effect beyond the age of 24 years (Wilkie et al., 1998). Cluster suicides are 4 times greater in the below 25 age group and account for 5% of all teenage suicides in the United States (Wilkie et al., 1998). The majority of imitative suicides takes place within the first ten days of learning of the original suicide but can take place more than six months later (Poijula, Wahlburg, & Dyregrov, 2001). The risk factors for a suicide cluster are presence of emotional or mental illness, substance abuse, previous suicide attempt, a recent loss, family instability, presence of multiple caregivers, abnormal response to stress, genetic disposition, and societal beliefs of appropriate suicide (Wilkie et al., 1998). Suicide contagion is defined as the increase of one person's risk of suicide by another person's suicide (Poijula et al., 2001). Poijula et al. (2001) recommend proper crisis intervention to prevent suicide contagion in schools. Sensationalistic media accounts of suicide lead to copycat attempts (Bloch, 1999). The chance of cluster suicide decreases among youth if they learn that a suicide victim was psychiatrically disturbed, was functioning in a psychopathological way, or was subject to individual psychosocial stressors (Poijula et al., 2001).

The Economic Impact of Suicide

The years of potential life lost (YPLL) to an adolescent as the result of premature death is a measurable cost of suicide and was the sixth leading cause of YPLL among women and third leading cause of YPLL among men in Canada (Bell & Clark, 1998; Bloch, 1999, Malchy, 1997). An immeasurable amount of grief is felt by the friends and family of suicide victims (Bloch, 1998). Most suicides occur at home and the potential

psychological damage to the family members who discover the body of the suicide victim must be emphasized due to the possible stress disorders caused by such an event (Bell & Clark, 1998). Less visible economic costs of suicide due to emergency medical or surgical care for suicide attempts, long-term disability following suicide attempts, psychological follow-up care for patients who attempt suicide, other medical costs and lost income due to disability, and premature mortality is estimated to be $8 billion in the United States alone (Bell & Clark, 1998; Tondo et al., 1998; Tondo & Baldessarini, 2000).

Health Care System Improvements that Could Reduce Suicide Incidence

Miller and Druss (2001) estimated that compared to people who die of other conditions, suicide victims are nearly 3 times as likely to be unable to receive needed care and twice as likely to have been refused needed care. In British Columbia during 1994-1995, only 14% of males and 37% of females aged 20-24 who committed suicide at the time of the suicide, were seeing a mental health professional, being treated with medication for a mental health problem or participating in a therapeutic group lead by a mental health professional (White & Rouse, 1997). On a population level, suicide outcomes can be improved by screening for depression with a feed back system that helps to ensure follow up treatment through the cooperation of health providers and the school community (Jellinek & Snyder, 1998; Stovall & Domino, 2003). In British Columbia during 1994-1995, the most common sites of mental health care for those aged 24 and under who eventually died by suicide were hospital inpatient programs, general practitioners, and the community mental health center (White & Rouse, 1997). However,

most physicians do not have an appropriate level of training or experience to assess suicidal risk (Jellinek & Snyder, 1998). Physicians can minimize the risk of suicide among their patients through thorough appropriate training for the assessment of the presence of psychiatric illnesses, awareness of clinical and social situations that might lead to suicide, and initiating appropriate treatment or facilitating access to treatment for patients with psychiatric disorders (Jellinek & Snyder, 1998; Stovall & Domino, 2003). Psychotherapeutic treatment of at-risk adolescents is the most effective method to reduce the rate of adolescent suicide (Bloch, 1999). Other useful suicide prevention strategies include educating patients and their families about mental illness, safe storage of medications and restriction to lethal means (Appleby et al., 1999; Bloch, 1999; Pelkonen & Marttunen, 2003; Stovall & Domino, 2003).

CHAPTER TWO: GOALS, OBJECTIVES AND METHODS

Goals:

The purpose of the study was to measure the relation of demographic characteristics, socioeconomic characteristics, health care utilization and parental health care utilization to self-injury by depressed youth. Our goal was to identify the risk factors related to self-injury among depressed British Columbian youth. Ultimately, the goal of the study was to develop a profile that would allow health care workers and parents to identify depressed youth who may self-injure.

***Objectives*:**

1) Describe the causes of death and self-injury in this cohort.

2) Compare demographic characteristics (age, sex, health authority, percentage of Aboriginals in the health service distribution area and percentage of visible minorities in the health service distribution area) of depressed youth who did and did not self-injure.

3) Compare socioeconomic characteristics (population size, population density, percentage of lone parent families in the local health authority, average census family income, average female lone parent income and percentage of population 15 years or older with post-secondary qualifications) of depressed youth who did and did not self-injure.

4) Compare the Medical Service Plan records (MSP) of depressed youth who did and did not self-injure. Specifically, this allowed comparisons of frequency and types of medical

diagnoses given to depressed youth who did and did not self-injure. Also, this allowed comparisons of the frequency and type of health care professionals and services utilized by depressed youth who did and did not self-injure.

5) Compare the Medical Service Plan records (MSP) of the parents of the depressed youth who did and did not self-injure. Specifically, this allowed comparisons of the frequency and types of medical diagnoses given to the parents of depressed youth who did and did not self-injure. This also allowed comparisons of the frequency and type of health care professionals and services utilized by the parents of depressed youth who did and did not self-injure.

6) Identify the relation of demographic characteristics, socioeconomic characteristics and mental and physical co-morbidity to self-injury.

Methods

Study Design: This was a population-based prospective cohort study on mental health care utilization for depressed youth utilizing administrative data.

Data Linkage: Cohort data were linked longitudinally from 1991/1992 to all further BC MSP activity continuing until fiscal year 2001/2002, as well as to any subsequent inpatient treatment recorded in BC Hospital Separation Abstracts during the same time period. In addition the members' data were linked to Vital Statistics records. Data for members of the cohort were also linked to their custodial parent's MSP file data using the

dependent's MSP number to obtain information on the custodial parent's mental health co-morbidity.

Linked Databases:

Registration File

Demographic and residence location information were obtained for members of the cohort.

Medical Services Plan (MSP)

The MSP payment information masterfile contains annual, fiscal-year files of services provided to MSP-covered individuals by practitioners, billed to MSP, and paid by MSP. This type of file is a payment file, so it represents services paid for during the fiscal year, rather than services provided during the fiscal year. Those billing MSP were separated into three groups: physicians, supplementary benefit practitioners (physiotherapists, massage practitioners, naturopathic physicians, etc.), and out-of-province practitioners. In addition, ICD-9 diagnostic coding was available for the fiscal years 1991/1992 and beyond. Health service utilization, diagnostic information and parental mental health were collected for the entire 10 fiscal year study period.

Hospital Separations

Hospital separations file: A file of separations (discharges, transfers, and deaths) of in-patients and day surgery patients from acute care hospitals in BC. Included in this file

were ICD-9 diagnostic and procedure codes. Health service utilization through hospital admissions were collected for the entire 10 fiscal year study period.

Vital Statistics

Included in the death file is the date of death. Cause of death is only included for those youth that died in hospital.

Derivation of Census Data Variables

Percentage of Aboriginals in the Local Health Authority

The first variable that utilized census data was the percentage of Aboriginals in the local health authority in which the youth resided in 1991/1992. The local health authority of an individual was determined from the individual's registry file during the inception year of the study. Determination of the percentage of Aboriginals in each local health authority was based on 2001 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were categorized by proportion of the population that was Aboriginal into low (2% or less of the population were Aboriginal), medium (greater than 2% and less than 3.8% of the population were Aboriginal) and high (3.8% or more of the population were Aboriginal) areas. The percentages of Aboriginals represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low Aboriginal presence groups are summarized in Table 1.

Table 1. *Summary of the Local Health Authorities and Percentage of Aboriginals in Each Group Represented by the Low, Medium and High Aboriginal Presence Group Divisions.*

Group (Percentage of Aboriginals in the Local Health Authority Represented by the Group)	Local Health Authorities Represented by the Group
Low Aboriginal Presence (≤2%)	Richmond, Sunshine Coast, Burnaby, Coquitlam, Delta, North Vancouver, Arrow Lakes, Surrey, Vancouver Aggregate
Medium Aboriginal Presence (2%<x<3.8%)	Gulf Islands, Summerland, Abbotsford, Langley, Greater Victoria, Qualicum, Kimberley, Nelson, Central Okanagan, Revelstoke, Castlegar, Penticton, New Westminister, Trail, Saanich, Courtney, Kettle Valley, Fernie, Sooke
High Aboriginal Presence (≥3.8%)	Kootenay Lake, Armstrong-Spallumcheen, Grand Forks, Princeton, Creston, Southern Okanagan, Salmon Arm, Vernon, Sunshine Coast, Nanaimo, Golden, Chilliwack, Powell River, Mission, Windermere, Cranbrook, Kamloops, Enderby, 100 Mile House, Howe Sound, North Thompson, Smithers, Campbell River/Vancouver Island West, Lake Cowichan, Cowichan, Quesnel, Prince George, Ladysmith, Keremeos, Peace River North, Kitimat, Peace River South, Hope, Alberni, Cariboo-Chilcotin, Terrace, Agassiz-Harrison, Nechako, Vancouver Island North, Burns Lake, Fort Nelson, Merrit, South Cariboo, Prince Rupert, Lillooet, Queen Charlotte, Bella Coola Valley, Nisga'a

Percentage of Visible Minorities in the Health Service Distribution Area

The second variable that utilized census data was the percentage of visible minorities as a whole in the youth's health service delivery area. The health service delivery area of an individual was determined from the individual's registry file during the inception year of the study. Health service delivery area was used in this analysis instead of local health authority to allow the group sizes to be more equal. Determination of the percentage of visible minorities in each health service delivery area was based on 2001 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Health service delivery areas were divided according to the percentage of the population that were visible minorities into low (less than 12.5% of the population were visible minorities),

medium (12.5% or more and less than 32.8% of the population were visible minorities) and high (32.8% or more of the population were visible minorities) areas. The percentages of visible minorities represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low presence of visible minority presence groups are summarized in Table 2.

Table 2. *Summary of the Health Service Distribution Areas and Percentage of Visible Minorities in Each Group Represented by the Low, Medium and High Visible Minority Presence Group Divisions.*

Group (Percentage of Visible Minorities in the Health Service Delivery Area Represented by the Group)	Health Service Delivery Areas Represented by the Group
Low Visible Minority Presence (<12.5%)	Vancouver Island South, Northwest, Northern Interior, Vancouver Island Central, Thompson Cariboo Shuswap, Okanagan, Vancouver Island North, Kootenay Boundary, East Kootenay, Northeast
Medium Visible Minority Presence (12.5%≤x<32.8%)	Fraser South, North Shore/Coast Garibaldi, Fraser East
High Visible Minority Presence (≥32.8%)	Richmond, Vancouver, Fraser North

Population Size of Local Health Authority

The third variable that utilized census data was the population size of the youths' local health authority. The local health authority was determined from the individual's registry file during the inception year of the study. Determination of the population size of each local health authority was based on 2001 Census data (BC Stats: Socio-Economic

Profiles by LHA, 2005). Local health authorities were divided into low (96,163 or less people), medium (greater than 96,163 people and less than 212,058 people) and high (212,058 or more people) population areas. The population sizes represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low population groups are summarized in Table 3.

Table 3. *Summary of the Local Health Authorities and Population Size of Each Group Represented by the Low, Medium and High Population Group Divisions.*

Group (Population of the Local Health Authority Represented by the Group)	Local Health Authorities Represented by the Group
Low Population Size (≤96,163)	Kootenay Lae, Armstrong-Spallumcheen, Grand Forks, Princeton, Creston, Southern Okanagan, Salmon Arm, Vernon, Sunshine Coast, Nanaimo, Golden, Chilliwack, Powell River, Mission, Windermere, Cranbrook, Enderby, 100 Mile House, Howe Sound, North Thompson, Smithers, Campbell River/Vancouver Island West, Lake Cowichan, Cowichan, Quesnel, Ladysmith, Keremeos, Peace River North, Kitimat, Peace River South, Hope, Alberni, Cariboo-Chilcotin, Terrace, Agassiz-Harrison, Nechako, Vancouver Island North, Burns Lake, Fort Nelson, Merrit, South Cariboo, Prince Rupert, Lillooet, Queen Charlotte, Bella Coola Valley, Nisga'a, Gulf Islands, Summerland, Qualicum, Kimberley, Nelson, Revelstoke, Castlegar, Penticton, New Westminister, Trail, Saanich, Courtney, Kettle Valley, Fernie, Sooke
Medium Population Size (96,163<x<212,058)	Coquitlam, Burnaby, Richmond, Central Okanagan, North Vancouver, Abbotsford, Langley, Kamloops, Prince George, Delta
High Population Size (≥212,058)	Vancouver Aggregate, Surrey, Greater Victoria

Population Density of Local Health Authority

The fourth variable that utilized census data was the population density (measured as population size per square kilometer) of the local health authority that the individual is

from. The local health authority of an individual was determined from the individual's registry file during the inception year of the study. Determination of the population density of each local health authority was based on 2001 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were divided into low (70.9 population/km^2 or less), medium (greater than 70.9 population/km^2 and less than 1,275.8 population/km^2) and high (1,275.8 population/km^2 or more) density population areas. The population densities represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low density population groups are summarized in Table 4.

Table 4. *Summary of the Local Health Authorities and Population Density of Each Group Represented by the Low, Medium and High Population Density Group Divisions.*

Group (Population of the Local Health Authority Represented by the Group (Population/ km^2))	Local Health Authorities Represented by the Group
Low Population Density (≤70.9)	Kootenay Lae, Armstrong-Spallumcheen, Grand Forks, Princeton, Creston, Southern Okanagan, Salmon Arm, Vernon, Sunshine Coast, Nanaimo, Golden, Chilliwack, Powell River, Mission, Windermere, Cranbrook, Enderby, 100 Mile House, Howe Sound, North Thompson, Smithers, Campbell River/Vancouver Island West, Lake Cowichan, Quesnel, Ladysmith, Keremeos, Peace River North, Kitimat, Peace River South, Hope, Alberni, Cariboo-Chilcotin, Terrace, Agassiz-Harrison, Nechako, Vancouver Island North, Burns Lake, Fort Nelson, Merrit, South Cariboo, Prince Rupert, Lillooet, Queen Charlotte, Bella Coola Valley, Nisga'a, Gulf Islands, Summerland, Qualicum, Kimberley, Nelson, Revelstoke, Castlegar, Penticton, Trail, Courtney, Kettle Valley, Fernie, Sooke, Central Okanagan, Kamloops, Prince George
Medium Population Density (70.9<x<1,275.8)	Surrey, Delta, Saanich, Langley, North Vancouver, Abbotsford, Coquitlam, West Vancouver-Bowen Island, Cowichan
High Population Density (≥1,275.8)	Vancouver Aggregate, New Westminister, Burnaby, Greater Victoria, Richmond

Percentage of Lone Parent Families in the Local Health Authority

The fifth variable that utilized census data was the percentage of families with children that had a lone parent in the local health authority that the individual is from. The local health authority of an individual was determined from the individual's registry file during the inception year of the study. Determination of the percentage of lone parent families in each local health authority was based on 2001 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were divided into low (less than 23.6% of the families with children were lone parent families), medium (23.6% or more and less than 27.7% of the families with children were lone parent families) and

high (27.7% or more of the families with children were lone parent families) areas. The percentages of lone parent families represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low presence of lone parent family groups are summarized in Table 5.

Table 5. *Summary of the Local Health Authorities and Percentage of Lone Parent Families in Each Group Represented by the Low, Medium and High Presence of Lone Parent Families Group Divisions.*

Group (Percentage of Lone Parent Families in the Local Health Authority Represented by the Group)	Local Health Authorities Represented by the Group
Low Percentage of Single Parent Families (<23.6%)	Surrey, Nechako, Maple Ridge, North Vancouver, Howe Sound, Langley, Abbotsford, Golden, Coquitlam, Saanich, Fernie, Richmond, Smithers, Peace River North, West Vancouver – Bowen Island, Delta
Medium Percentage of Single Parent Families (23.6%≤x<27.7%)	Vancouver Aggregate, Keremeos, Mission, Terrace, Carinoo-Chilcotin, Central Okanagan, Windermere, Qualicum, Castlegar, Southern Okanagan, Salmon Arm, Cranbrook, Sooke, Summerland, Peace River South, Fort Nelson, 100 Mile House, Trail, Kettle Valley, Burnaby, Revelstoke, Burns Lake, Kitimat, Kimberley, Armstrong-Spallumcheen
High Percentage of Single Parent Families (≥27.7%)	Prince George, Vancouver Island North, Cowichan, Chilliwack, Princeton, Sunshine Coast, Quesnel, Campbell River/Vancouver Island West, Powell River, Kamloops, North Thompson, Creston, Lake Cowichan, Courtney, Enderby, South Cariboo, Nelson, Nisga'a, Agassiz-Harrison, Ladysmith, New Westminister, Alberni, Vernon, Merritt, Gulf Islands, Arrow Lakes, Grand Forks, Prince Ruprt, Nanaimo, Bella Cool Valley, Greater Victoria, Penticton, Hope, Lillooet, Queen Charlotte, Kootenay Lake

Average Census Family Income of Local Health Authority

The sixth variable that utilized census data was the average census family income of the local health authority that the individual is from. The local health authority of an

individual was determined from the individual's registry file during the inception year of the study. Determination of the average census family income of each local health authority was based on 2000 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were divided into low (less than $60,922 per census family per year), medium ($60,922 or more per census family per year and less than $69,451 per census family per year) and high ($69,451 or more per census family per year) areas. The average incomes represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low presence of census family income groups are summarized in Table 6.

Table 6. *Summary of the Local Health Authorities and Average Annual Census Family Income in Each Group Represented by the Low, Medium and High Average Annual Census Family Income Groups.*

Group (Average Annual Census Family Income in the Local Health Authorities Represented by the Group)	Local Health Authorities Represented by the Group
Low Average Annual Census Family Income (<$60,922)	Burnaby, Cranbrook, Sooke, Castlegar, Kimberley, Nechako, Kamloops, Central Okanagan, Revelstoke, Peace River South, Cowichan Golden, Campbell River, Vancouver Island West, Abbotsford Windermere, Summerland, Mission, Cariboo-Chilcotin, Nanaimo, Sunshine Coast, Chilliwack, Queen Charlotte, Quesnel, Courtney, Gulf Islands, Alberni, Vernon, Burns Lake, Powell River, Nelson, Qualicum, South Cariboo, Ladysmith, Armstron-Spallumcheen, Penticton, Merritt, Salmon Arm, Princeton, North Thompson, Lake Cowichan, Hope, Agassiz-Harrison, 100 Mile House, Kettle Valley, Grand Forks, Lillooet, Creston, Arrow Lakes, Enderby, Southern Okanagan, Bella Coola Valley, Kootenay Lake, Nisga'a, Keremeos
Medium Average Annual Census Family Income ($60,922≤x<$69,451)	Richmond, Prince Rupert, Peace River North, Prince George, Maple Ridge, Smithers, Surrey, Greater Victoria, New Westminister, Trail, Fernie, Vancouver Island North, Terrace
High Average Annual Census Family Income (≥$69,451)	West Vancouver – Bowen Island, North Vancouver, Delta, Saanich, Kitimat, Langley, Fort Nelson, Howe Sound, Coquitlam, Vancouver Aggregate

Average Female Lone Parent Income of Local Health Authority

The seventh variable that utilized census data was the average female lone parent income of the local health authority that the individual is from. The local health authority of an individual was determined from the individual's registry file during the inception year of the study. Determination of the average female lone parent income of each local health authority was based on 2000 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were divided into low (less than $32,153 per female lone parent per year), medium ($32,153 or more per female lone parent per year and less than $37,422 per female lone parent per year) and high ($37,422 or more per female lone

parent per year) areas. The average incomes represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low average income of female lone parent groups are summarized in Table 7.

Table 7. *Summary of the Local Health Authorities and Average Annual Income of Female Lone Parents in Each Group Represented by the Low, Medium and High Average Annual Female Lone Parent Income Groups.*

Group (Average Annual Female Lone Parent Income in the Local Health Authorities Represented by the Group)	Local Health Authorities Represented by the Group
Low Average Annual Female Lone Parent Income (<$32,153)	Central Okanagan, Ladysmith, Revelstoke, Grand Forks, Cranbrook, Vernon, Penticton, Qualicum, Salmon Arm, Abbotsford, Terrace, Smithers, Princeton, Courtney, Neslon, 100 Mile House, Kamloops, Kettle Valley, Nanaimo, Mission, Peace River North, Nechako, Golden, Castlegar, Peace River South, Prince George, Sunshine Coast, Lillooet, Chilliwack, Cariboo-Chilcotin, South Cariboo, Queen Charlotte, Creston, Southern Okanagan, Cowichan, Merritt, Kimberley, North Thompson, Alberni, Kitimat, Powell River, Hope, Campbell River/Vancouver Island West, Armstrong-Spallumcheen, Prince Rupert, Quesnel, Fort Nelson, Burns Lake, Fernie, Kootenay Lake, Arrow Lakes, Enderby, Agassiz-Harrison, lake Cowichan, Bella Coola Valley, Nisga'a Keremeos
Medium Average Annual Female Lone Parent Income ($32,153≤x<$37,422)	Coquitlam, New Westminister, Burnaby, Greater Victoria, Windermere, Surrey, Sooke, Gulf Islands, Maple Ridge, Summerland, Vancouver, Island North, Howe Sound, Trail
High Average Annual Female Lone Parent Income (≥$37,422)	West Vancouver – Bowen Island, Delta, North Vancouver, Saanich, Richmond, Langley, Vancouver Aggregate

Percentage of Population 15 Years of Age or Older with Post Secondary Qualifications of Local Health Authority

The eighth and final variable that utilized census data was the percentage of the population 15 years of age or older with post secondary qualifications (Diploma of University Degree) in the local health authority that the individual is from. The local health authority of an individual was determined from the individual's registry file during the inception year of the study. Determination of the percentage of the population in each local health authority that was 15 years of age or older and had post secondary qualifications were based on 2001 Census data (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities were divided into low (less than 54.3% of the population 15 years or older had post secondary qualifications), medium (54.3% or more of the population 15 years or older had post secondary qualifications and less than 46.8% of the population 15 years or older had post secondary qualifications) and high (46.8% or more of the population 15 years or older had post secondary qualifications) areas. The percentage of the population 15 years or older that had post secondary qualifications represented by low, medium and high areas were arbitrarily decided upon to allow the groups to have as equal an amount of individuals as possible for statistical comparison. The details of the high, medium and low percentage of the population 15 years or older with post secondary qualifications groups are summarized in Table 8.

Table 8. *Summary of the Local Health Authorities and Percentage of the Population 15 Years or Older with Post Secondary Qualifications in Each Group Represented by the Low, Medium and High Percentage of the Population 15 Years or Older with Post Secondary Qualifications.*

Group (Percentage of the Population 15 Years or Older with Post Secondary Qualifications in the Local Health Authorities Represented by the Group)	Local Health Authorities Represented by the Group
Low Percentage of the Population 15 Years or Older with Post Secondary Qualifications (<46.8%)	Surrey, Lillooet, Kootenay Lake, Penticton, Creston, Salmon Arm, Prince George, Vernon, Campbell River/Vancouver Island West, Cariboo-Chilcotin, Agassiz-Harrison, Arrow Lakes, Revelstoke, Lake Cowichan, Powell River, Grand Forks, Mission, Terrace, Abbotsford, Chilliwack, Fort Nelson, Bella Coola Valley, Peace River South, Vancouver Island North, Armstrong-Spallumcheen, Queen Charlotte, Kettle Valley, Prince Rupert, Peace River North, Kitmat, Enderby, Alberni, Nisga'a, 100 Mile House, Merritt, Hope, North Thompson, Golden, Keremeos, Southern Okanagan, Princeton, Burns Lake, Quesnel, Nechako, South Cariboo
Medium Percentage of the Population 15 years or Older with Post Secondary Qualifications (46.8%≤x<54.3%)	Burnaby, Howe Sound, Nelson, Richmond, Sunshine Coast, Delta, New Westminister, Kimberley, Windermere, Sooke, Trail, Nanaimo, Cowichan, Qualicum, Summerland, Central Okanagan, Courtney, Maple Ridge, Cranbrook, Langley, Ladysmith, Castlegar, Kamloops, Smithers, Fernie
High Percentage of the Population 15 years or Older had Post Secondary Qualifications (≥54.3%)	West Vancouver – Bowen Island, North Vancouver, Gulf Islands, Saanich, Vancouver Aggregate, Greater Victoria, Coquitlam

Population: The cohort included all youth less than 25 years of age, who had utilized the public health care system in British Columbia during the fiscal year 1991/1992 for the treatment of depression. All patients meeting these criteria during the year were included in the cohort.

According to Stovall and Domino (2003), major depression is the most important risk factor for suicide and is associated with more than 50% of completed suicides. As a

result, the goal of the study was to determine what the risk factors were for self-injury among the population of depressed youth. To be classified as someone with depression, the individual had either a primary diagnosis of depression or at least two secondary diagnoses of depression within the period of a year, using the ICD9-CM codes of 296.2, 296.3, 296.5, 298, 301.12 and 311. These codes and meanings are summarized in Table 9.

Table 9. *ICD9-CM Codes Used for Diagnosing Depression and their Meaning.*

ICD9-CM Code	Meaning
296.2	Major depressive disorder, single episode
296.3	Major depressive disorder, recurrent episode
296.5	Bipolar affective disorder, depressed
298	Manic-depressive psychosis, other and unspecified
301.12	Chronic depressive personality disorder
311	Depressive disorder, not elsewhere classified

Despite the common use of the term in clinical practice, infant depression is poorly defined and difficult to assess (Guedenay, 1997). Infant depression may also manifest as anaclitic depression (caused by separation anxiety and disruption of attachment bonds), failure to thrive or protein energy malnutrition disorders (i.e. Kwashiorkor) (Guedeney, 1997). According to Guedeney (1997), depression may present very early on in infancy as withdrawal, possibly as early on as birth. Due to the possibility of infant depression from birth, there is no lower cutoff age for depressed youth in this study.

The cohort was divided into two groups. The first group was the "self-injure" group. Youth who self-injured were identified from the cohort by selecting individuals

designated by their BC Hospital Separations file of having an admission with a diagnosis or external cause of injury E-coded in the range E950-E959; these codes are summarized in Table 10. These codings are assigned to patients in a conservative manner. If the intent (accident, self-harm, assault) of the cause of an injury or poisoning is unknown, unspecified, questionable, probable or suspected it will be coded in a separate code (E980-E989) as undetermined.

If an individual had been hospitalized due to self-injury at least once during the study period, they were put into the "self-injure" group. As a result, not all the individuals that self-injured during the study period could be captured (i.e. those that were not hospitalized for self-injury were excluded). The second group was the "did not self-injure group". If an individual was not hospitalized due to self-injury at least once during the study period, they were placed in the "did not self-injure" group. There were 7698 youth involved in the study; 843 youth belonged to the "self-injure" group and 6855 youth belonged to the "did not self-injure" group.

Table 10. *E-Codes E950-E959 and their Meaning as Related to Self-Injury.*

ICD9 E-Code	Meaning
E950	Suicide and self-inlficted poisoning by solid or liquid substances
E950.0	Analgesics, antipyretics and antirheumatics
E950.1	Barbiturates
E950.2	Other sedatives and hypnotics
E950.3	Tranquilizers and other psychotropic agents
E950.4	Other specified drugs and medicaments
E950.5	Unspecified drug or medicament
E950.6	Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers
E950.7	Corrosive and caustic substances
E950.8	Arsenic and its compounds
E950.9	Other and unspecified solid and liquid substances

E951	Suicide and self-inflicted poisoning by gases in domestic use
E951.0	Gas distributed by pipeline
E951.1	Liquefied petroleum gas distributed in mobile containers
E951.8	Other utility gas
E952	Suicide and self-inflicted poisoning by other gases and vapours
E952.0	Motor vehicle exhaust gas
E952.1	Other carbon monoxide
E952.8	Other specified gases and vapours
E952.9	Unspecified gases and vapours
E953	Suicide and self-inflicted injury by hanging, strangulation and suffocation
E953.0	Hanging
E953.1	Suffocation by plastic bag
E953.8	Other specified means
E953.9	Unspecified means
E954	Suicide and self-inflicted injury by submersion (drowning)
E955	Suicide and self-inflicted injury by firearms and explosives
E955.0	Hand gun
E955.1	Shot gun
E955.2	Hunting Rifle
E955.3	Military firearms
E955.4	Other and unspecified firearm
E955.5	Explosives
E955.9	Unspecified
E956	Suicide and self-inflicted injury by cutting and piercing instruments
E957	Suicide and self-inflicted injury by jumping from high place
E957.0	Residential premises
E957.1	Other manmade structures
E957.2	Natural sites
E957.9	Unspecified
E958	Suicide and self-inflicted injury by other and unspecified means
E958.0	Jumping or lying before a moving object
E958.1	Burns, fire
E958.2	Scald
E958.3	Extremes of cold
E958.4	Electrocution
E958.5	Crashing of a motor vehicle
E958.6	Crashing of an aircraft
E958.7	Caustic substances, except poisoning
E958.8	Other specified means
E958.9	Unspecified means
E959	Late effects of self-inflicted injury

The cohort of depressed youth identified in 1991/1992 was followed for 10 years (until fiscal year 2001/2002) to ascertain suicide risk factors, health system diagnoses and health care utilization patterns. Also, the health system diagnoses and health care utilization patterns of the parents of youth in the depressed cohort were linked.

***Data analysis*:**

Objective 1: First, the number of deaths in the cohort was presented including information on whether death occurred in hospital and whether death occurred in hospital due to self injury. Next, the cause of death for the individuals that died in hospital were presented. Finally, the hospital files of each individual contained information regarding the cause of hospitalization were used to present cause of self-injury. These causes were listed in either the Medical Service Plan (MSP) diagnostic categories or the E-codes, both of which are based on the ninth revision of the International Classification of Diseases (ICD9) codes created by the World Health Organization (Medical Services Plan Homepage, 2005). Anyone with an E-code from E950 to E959 (suicide or self-injury), were grouped into the self-injury group. The files also contained the date of each self-injury. With this information, the main cause of each individual's self-injury could be summarized in a chronological fashion from their first to fifth hospitalization due to self-injury over the 10 year period of this study. The first 5 hospitalizations due to self-injury were chosen because 96.8% of those that were hospitalized due to self-injury self-injured 5 times or less over the 10 year period of the study. There were outliers in that one individual self-injured 63 times, the next highest self-injured 39 times and the next

highest self-injured 29 times. For the rest of the subjects that self-injured more than five times over the course of the study, only the first 5 hospitalizations due to self-injury were included.

Objective 2: Compare demographic characteristics (age, sex, health authority, percentage of Aboriginals in the health service distribution area and percentage of visible minorities in the health service distribution area) of depressed youth who did and did not self-injure.

The frequency and type of services utilized were quantified and compared across health regions by analyzing linked provincial administrative data. Categorical variables were reported as counts and percentages and compared using chi-square tests of independence. Chi square tests of independence utilizing the Bon Ferroni Correction were utilized for the post hoc analysis of the categorical variables. Continuous variables were reported as mean ranks and analyzed using the non-parametric Mann-Whitney U-test because serious violations to linearity occurred in the variables. The variables studied and the justifications for study are listed below:

- Age – According to White and Rouse (1997), the greatest increases in suicide rates in British Columbia occurred among youth under the age of 24. Primarily, age was included to determine if there was a difference among depressed youth that did and did not self-injure in this population because age seemed to affect suicide rates in the BC population. According to the Kolmogorov-Smirnov test of normality, the age data for those that did not self-injure (K-S=0.119, df=6855, $p<0.0005$) and those that self-injured (K-S=0.068, df=843, $p<0.0005$) were not normally distributed. Due to the violation of the normality assumption in the

data, a Mann-Whitney U-test was conducted to compare the median age of those that did and did not self-injure because t-tests require normally distributed data.

- Sex – According to Stovall and Domino (2003), females attempt suicide more often than men, but by less-lethal means. Sex was included to determine if females self-injured more than men in this population.
- Residence location by health authority – Residence was included to determine which geographical regions had the highest and lowest amounts of self-injury.
- Percentage of Aboriginals in the local health authority - Suicide rates are much higher for Aboriginal groups in Canada than any other population segment (Ferry, 2000). Percentage of Aboriginals in the health service distribution area was included to determine if individuals from health service distribution areas with a higher percentage of Aboriginals had a higher amount of self-injury than individuals from health service distribution areas with a low percentage of Aboriginals.
- Percentage of visible minorities in health service distribution area – Due to the reported increased suicide rates among Aboriginal populations, the effect of visible minorities as a whole (including Aboriginals) on self-injury needs to be determined since this area is not well documented in the literature. Percentage of visible minorities in the health service distribution areas was included to determine if individuals from health service distribution areas with a higher percentage of visible minorities had a higher amount of self-injury than individuals from health service distribution areas with a lower percentage of visible minorities.

Objective 3: Compare socioeconomic characteristics (population size, population density, percentage of lone parent families in the local health authority, average census family income, average female lone parent income and percentage of population 15 years or older with post-secondary qualifications) of depressed youth who did and did not self-injure.

The frequency and type of services utilized were quantified and compared across health regions by analyzing linked provincial administrative data. Categorical variables were reported as counts and percentages and compared using chi-square tests of independence. Chi square tests of independence utilizing the Bon Ferroni Correction were utilized for the post hoc analysis of the categorical variables. The variables studied and the justifications for study are listed below:

- Population size – There are higher suicide rates in rural areas compared to urban areas in Canada (Rost et al., 1998). Rural areas tend to have relatively small populations, so population size was used as a measure of rurality. Population size was included to determine if individuals from local health authorities with a lower population size had a higher amount of self-injury than authorities of a high population size.
- Population density – This was measured in number of people per square kilometer and was another measure of rurality. Some local health areas had high population sizes and low population densities and vice versa, so analyses of both population size and density were done. Population density was included to determine if individuals from local health authorities with a lower population

density had a higher amount of self-injury than authorities of a higher population density.

- Percentage of lone parent families in the local health authority – A non-intact family of origin is associated with an increased rate of suicide (Stovall and Domino, 2003). Percentage of lone parent families in the local health authority was included to determine if individuals from local health authorities with a higher percentage of lone parent families had a higher amount of self-injury than individuals from local health authorities with a lower percentage of lone parent families.
- Average census family income – According to the BC Stats Glossary webpage (2005), a census family is a husband and wife (including common-law) or same-sex couple (new with 2001 Census) with or without children at home, or a lone parent with children at home. The relation of income to suicide and self-injury is not well documented. Average census family income was included to determine if individuals from local health authorities with a higher average census family income had a higher amount of self-injury than individuals from local health authorities with a lower average census family income.
- Average female lone parent income – This is another aspect of the affect of income on suicide and self-injury which is not well documented. Average female lone parent income was included to determine if individuals from local health authorities with a higher average female lone parent income had a higher amount of self-injury than individuals from local health authorities with a lower average female lone parent income.

- Percentage of population 15 years or older with post-secondary qualifications – Post-secondary qualifications included a post-secondary certificate, diploma or university degree. It has been shown that people that complete suicide come from families with lower levels of education (Runeson, 1998). Percentage of population 15 years or older with post-secondary qualifications was included to determine if individuals from local health authorities with a lower percentage of the population 15 years or older with post-secondary qualifications had a higher amount of self-injury than individuals from local health authorities with a higher percentage of the population 15 years or older with post-secondary qualifications.

Objective 4: Compare the Medical Service Plan records (MSP) of depressed youth that did and did not self-injure. Specifically, this allowed us to compare the frequency and types of medical diagnoses given to depressed youth that did and did not self-injure. This also allowed us to compare the frequency and type of health care professionals and services utilized by depressed youth who did and did not self-injure.

The frequency and type of diagnoses made and health care professionals and services utilized were quantified and compared by analyzing linked provincial administrative data. Continuous variables were reported as mean ranks and analyzed using the non-parametric Mann-Whitney U-test because serious violations to linearity occurred in the variables. The variables studied and the justifications for study are listed below:

- MSP Diagnostic Categories - When physicians submit claims to the Medical Services Plan, they must include a diagnostic category. These categories are

based on the ninth revision of the International Classification of Diseases (ICD9) codes created by the World Health Organization (Medical Services Plan Homepage, 2005). Using these categories, the differences in the frequency and types of diagnoses given to individuals that did and did not self-injure when they accessed the health care system during the study period could be studied. The MSP Diagnostic Code Categories that were studied are listed below in Table 11:

Table 11. *MSP ICD9 Diagnostic Codes Studied and their Descriptions.*

ICD9 Code	Name Used in Study	Full Diagnostic Code Description
001 – 139.9	Infection	Infectious and Parasitic Diseases
140 – 239.9	Neoplasms	Neoplasms
240 – 279.9	Endocrine	Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders
280 – 289.9	Blood diseases	Diseases of Blood and Blood-Forming Organs
290 - 319	Mental disorders	Mental Disorders
320 – 389.9	Nervous system	Diseases of Nervous System and Sense Organs
390 – 459.9	Circulatory	Diseases of Circulatory System
460 – 519.9	Respiratory	Diseases of Respiratory System
520 – 579.9	Digestive	Diseases of Digestive System
580 – 629.9	Genitourinary	Diseases of Genitourinary System
630 – 676.9	Pregnancy	Complications of Pregnancy, Childbirth, Puerperium
680 – 709.9	Skin	Diseases of Skin and Subcutaneous Tissue
710 – 739.9	Musculoskeletal	Diseases of the Musculoskeletal System and Connective Tissue
740 – 759.9	Congenital abnormalities	Congenital Anomalies
760 – 779.9	Perinatal period	Certain Conditions Originating in the Perinatal Period
780 – 799.9	Symptoms and ill-defined	Symptoms, Signs, and Ill-defined Conditions
800 – 999.9	Injury	Injury and Poisoning

Utilizing the Kolmogorov-Smirnov test of normality, it was found that none of the diagnostic categories had a normal distribution. All of the variables had an extremely positive skew (ranging from 1.782 to 23.569), resembling a Poisson distribution more than a normal distribution. As a result, it was decided that independent samples

t-tests would be inappropriate in the analysis of this data due to the violation of the assumption of normally distributed data. The results of the Kolmogorov-Smirnov tests of normality are summarized in Table A1, found in Appendix A.

- MSP Specialty Categories – are a practitioner's specialty associated with a claim, assigned at the time when the claim was processed. This is usually one of the practitioner's registered specialties and is a two digit code that identifies the specialty of a medical doctor (GP or Specialist) or a paramedical practitioner. A medical doctor is a specialist if he is registered as such by the College of Physicians and Surgeons of British Columbia. Using these categories, the differences in the frequency and types of health care providers seen by individuals that did and did not self-injure when they accessed the health care system during the study period could be studied. The MSP Specialty Code Categories that were studied are listed below in Table 12:

Table 12. *MSP Specialty Categories Studied.*

MSP Specialty Code Categories
General Practice
Dermatology
Neurology
Psychiatry
Neuropsychiatry
Obstetrics and Gynecology
Ophthalmology
Otolaryngology
General Surgery
Neurosurgery
Orthopaedic Surgery
Plastic Surgery
Urology
Paediatrics

Internal Medicine
Radiology
Cardio and Thoracic Surgery
Pathology
Anaesthesia
Paediatric Cardiology
Physical Medicine and Rehab
Public Health
Occupational Medicine
Geriatric Medicine
Emergency Medicine
Medical Microbiology
Chiropractor
Naturopathy
Physical Therapy
Nuclear Medicine
Osteopathy
Oral Surgery
Podiatry
Optometry
Dental Surgery
Oral Medicine
Orthodontia
Massage Therapy
Rheumatology
Clinical Immunization and Allergy
Medical Genetics
Vascular Surgery
Thoracic Surgery
Midwives of BC
Registered Nurse
Nutritionist or Dietitian
Counsellor
Educator
Licensed Practical Nurse
Medical Office Assistance
Nurse Practitioner
Respiratory Therapist
Home Support
Pharmacist
Out of Country Practitioner

Utilizing the Kolmogorov-Smirnov test of normality, it was found that none of the health care provider categories had a normal distribution. All of the variables had an extremely positive skew (ranging from 1.526 to 82.795),

resembling a Poisson distribution more than a normal distribution. As a result, it was decided that independent samples t-tests would be inappropriate in the analysis of this data due to the violation of the assumption of normally distributed data. The results of the Kolmogorov-Smirnov tests of normality are summarized in Table B1, found in the Appendix B. Normality tests for the self-injure groups for the specialty types geriatric medicine, oral medicine, orthodontia, nutritionist or dietician, and counselor were not done because no one in the self-injury group accessed these health care provider types. Also, normality tests for data related to specialty types clinical immunization and allergy, educator, respiratory therapist and home support were not done because no one from the study accessed these specialty types during the study period.

Objective 5: Compare the Medical Service Plan records (MSP) of the parents of the depressed youth that did and did not self-injure. By using the dependent number of youth to obtain information on corresponding custodial parents, the MSP data of parents of youth that did and did not self-injure could be studied. Specifically, this allowed us to compare the frequency and types of medical diagnoses given to the parents of depressed youth that did and did not self-injure. This also allowed us to compare the frequency and type of health care professionals and services utilized by the parents of depressed youth who did and did not self-injure. This was essentially the same study as objective 3, but studying parental MSP data instead of youth MSP data. Also, information about MSP service utilization was obtained for the parental data.

- MSP Service Categories – are two-digit codes to indicate the type of services rendered by a practitioner. Each of the thousands of fee items is associated with one and only one service code. Using these categories, we can study the differences in the frequency and types of health care services utilized by subjects that did and did not self-injure when they accessed the health care system during the study period. The frequency and type of diagnoses made and health care professionals and services utilized were quantified and compared by analyzing linked provincial administrative data. The variables studied for this objective were the same as those for objective 3. The MSP Service Code Categories that were studied are listed below in Table 13:

Table 13. *MSP Service Categories Studied.*

Service Type
GP Regional Examinations
GP Consultation
GP Complete Examinations
GP Counselling
GP Emergency Visits
GP Home Visits
GP Institutional Visits
GP Miscellaneous and Other
GP Visit Premiums
GP No Charge Referral
Specialist Consultation
Specialist Subsequent Visits
Specialist Counselling Psychotherapy
Specialist Home Visits
Specialist Emergency Visits
Specialist Institutional Visits
Specialist Miscellaneous and Other
Specialist Visit Premiums
Specialist Critical Care Services
Anaesthesia
Cardiovascular Surgery
Obstetrics
Surgery

Minor Surgery and Therapeutic Procedures
Unlisted Miscellaneous Surgery
Dialysis and Transfusions
General Services
Therapeutic Radiation
Procedural Premiums
Diagnostic Ophthalmology
Diagnostic Radiology
Diagnostic Ultrasound
Nuclear Medicine
Pathology Category 1
Pathology Beyond Category 1
Pulmonary Function
Electrodiagnosis
Procedural Cardiology
Other
Diagnostic Premiums

Utilizing the Kolmogorov-Smirnov test of normality, it was found that none of the diagnostic categories had a normal distribution. All of the variables had an extremely positive skew (ranging from 1.579 to 22.284), resembling a Poisson distribution more than a normal distribution. As a result, it was decided that independent samples t-tests would be inappropriate in the analysis of this data due to the violation of the assumption of normally distributed data. The results of the Kolmogorov-Smirnov tests of normality are summarized in Table C1, found in the Appendix C. Normality tests were not done for the parents of children that self-injure group for the "Symptoms and Ill-defined" diagnostic category data because no one from that group were given this diagnosis.

Utilizing the Kolmogorov-Smirnov test of normality, it was found that none of the health care provider categories had a normal distribution. All of the variables had an extremely positive skew (ranging from 1.252 to 32.404), resembling a Poisson distribution more than a normal distribution. As a result, it was decided that independent samples t-tests would be inappropriate in the analysis of this data due to the violation of the assumption of normally distributed data. The results of the Kolmogorov-Smirnov

tests of normality are summarized in Table D1, found in the Appendix D. Normality tests for the health care provider types paediatric cardiology, occupational medicine, oral surgery, orthodontia, clinical immunization, medical genetics, thoracic surgery, midwives, registered nurse, nutritionist or dietitian, counselor, educator, licensed practical nurse, medical office assistant, respiratory therapist, home support and pharmacist were not done because no one in the study accessed these health care provider types. Also, normality tests for the parents of children that self-injured group related to neuropsychiatry, geriatric medicine, osteopathy and nurse practitioner were not done because no one from that group accessed these specialty types during the study period.

Utilizing the Kolmogorov-Smirnov test of normality, it was found that none of the health care service categories had a normal distribution. All of the variables had an extremely positive skew (ranging from 1.652 to 32.404), resembling a Poisson distribution more than a normal distribution. As a result, it was decided that independent samples t-tests would be inappropriate in the analysis of this data due to the violation of the assumption of normally distributed data. The results of the Kolmogorov-Smirnov tests of normality are summarized in Table E1, found in the Appendix E. Normality tests for data related to Specialist Home Visits, Specialist Visit Premiums, Unlisted Miscellaneous Surgery, Therapeutic Radiation, Diagnostic Premiums and Diagnostic Opthalmolgy were not done because no one from the parents of children that did not self-injure and self-injury groups received these services during the study period. Also, normality tests for data related to GP Miscellaneous and Other, Specialist Miscellaneous and Other, Specialist Critical Care Services, Cardiovascular Surgery, Obstetrics, Dialysis or Transfusions and Procedural Cardiology were not done for the group of parents with

children that did not self-injure because they did not receive these services during the study period.

Objective 6: Identify the relationship of demographic characteristics, regional socioeconomic characteristics and mental and physical co-morbidity to predict self-injury. A logistic regression analysis was performed on self-injury as the outcome and 30 predictors: sex (male or female), age, percentage of Aboriginals in health service delivery area (high, medium or low), average income of census families in local health authority (high, medium or low), average income of female lone parents in local health authority (high, medium or low), population of local health authority (high, medium or low), population density of local health authority (high, medium or low), percentage of population over 15 years of age with post secondary qualifications in local health authority (high, medium or low), percentage of single parent families in local health authority (high, medium or low), percentage of visible minorities in health service distribution region (high, medium or low) and all the MSP diagnostic categories including infection, neoplasm, endocrine, blood diseases, mental disorders, nervous system, circulatory, respiratory, digestive, genitourinary, pregnancy, skin, musculoskeletal, congenital abnormalities, perinatal period, symptoms and ill-defined, injury, laboratory, x-ray and anaesthetic.

MSP Specialty data and MSP Service data were not used in the logistic regression analysis, because these data relate to treatment that youth receive in the hospital. The major goal of this part of the study was to discover predictors for self-injury that health care providers could use to identify youth that are at the greatest risk of self-injury, so as

to give them the best available treatment after identification. The Parental MSP data were also not used in this part of the study, because only 1157 parents could be linked to youth, so the parent data could not be used to predict self-injury for the 7457 youth used in the regression analysis.

The first step of this analysis involved running each of the predictors through univariate logistic regression analyses. All of the predictors that were significant on the univariate level were then run through a larger multivariate logistic regression analyses. Finally, to isolate the reliable predictors of self-injury, the predictors that were significant at the first stage multivariate level were then put into a final model.

Choice of Study Design: This study design addresses individuals under that age of 25 who were hospitalized due to self-injury. As a result, individuals who self-injured and are not hospitalized were not put into the self-injure group. Also, this study follows depressed youth in British Columbia from the fiscal year of 1991/1992. This results in the exclusion of otherwise eligible youth who were not diagnosed for depression in 1991/1992. This study design does not include community mental health services utilized, it captures MSP billings only. All health region data were taken from the inception year of 1991/1992 and are assumed to be the same throughout the study. This does not take into account individuals who moved out of their respective health regions during the study period. The demographic and socioeconomic data used in this study were from 2001 Census data which correspond only to the last year of this study. These data were linked to the 1991/1992 health region data for each individual which was then used to group all individuals. It was assumed again the individuals did not move out of

their respective health regions during the study period and that the same relative groupings of health regions would remain the same no matter which time period the Census data were taken from. For example, it was assumed that Vancouver aggregate would always be in the "high" population density grouping while Nisga'a would always be in the "low" population density grouping.

The strength of the study is that it captures the entire population of British Columbia youth diagnosed as depressed in 1991/1992 and allowed us to see the differences in demographic and socioeconomic backgrounds as well as the actual health care diagnoses and usage of youth that did and did not self-injure.

Ethical considerations: Research ethics approval was granted from the UNBC Research Ethics Board prior to the start of the research project. This research was also approved by the BC Government Data Stewards. This study does not contain patient identifiable information.

Contribution to the Health of British Columbians in the Immediate Future:

The findings of this study will be sent to all relevant local and provincial bodies associated with child and youth mental health services. It is anticipated that the information provided by this research will be useful for health planners in rural constituencies, for the treatment and care of children and youth suffering from depression and other mental illnesses. The findings from this study will also be important for policy development regarding human resource allocation and training of mental health professionals in rural BC. The population-based approach used in this study will allow all

health planners to make immediate decisions based on the most comprehensive, reliable and valid data available.

In addition, it is anticipated that the findings will be presented at local and national conferences as well as an international conference such as the American Public Health Association Annual Conference. Further, a manuscript based on the results will be submitted to a relevant peer-reviewed journal.

CHAPTER THREE: RESULTS

Summary of Death and Self-Injury Incidence and Causes

Deaths During the Study Period

Ninety-four individuals died during the study period due to all causes. Of those, 27 died in hospital due to all causes, 9 of whom died due to self injury. This information is summarized in Figure 1, stratified by fiscal year.

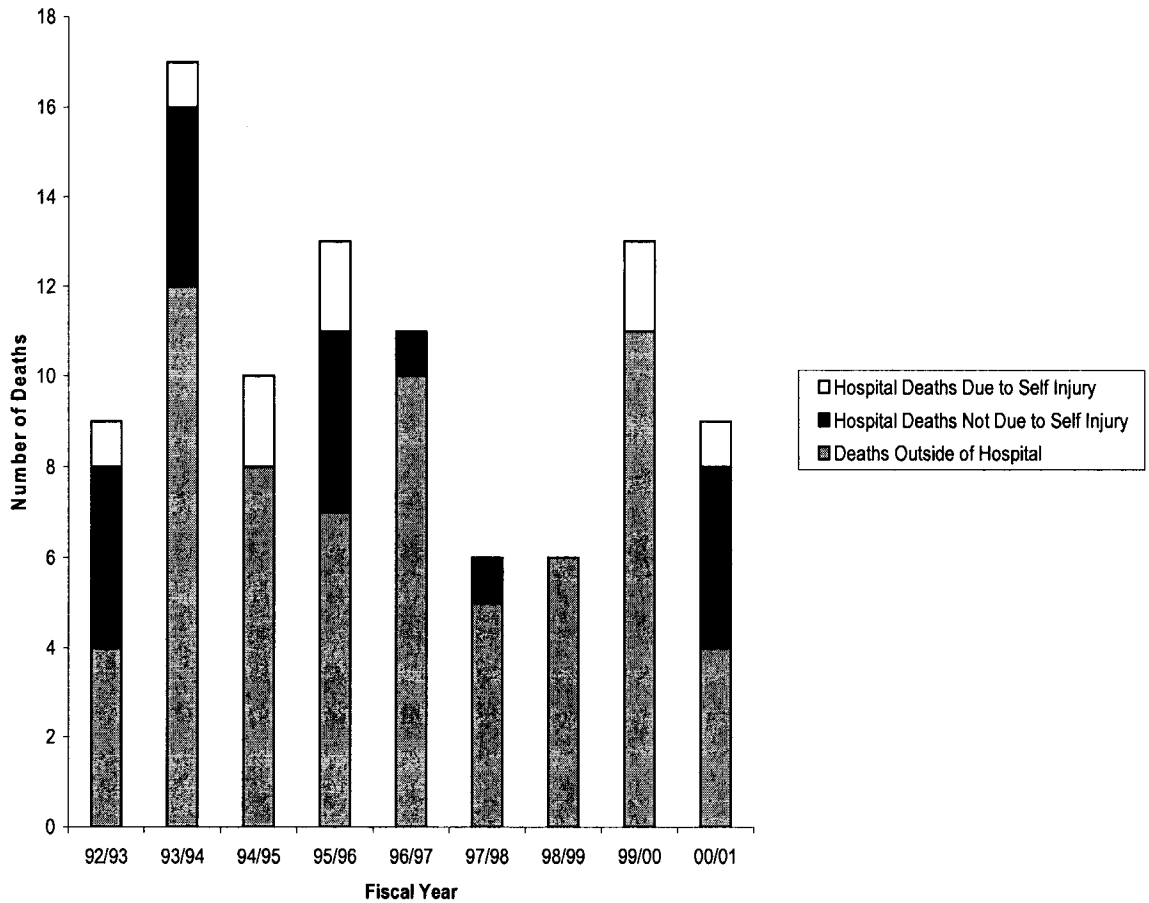

*Figure 1.*Stacked bar graph of number of deaths in cohort outside of hospital, hospital deaths due to self injury and hospital deaths not due to self injury.

Table 14 summarizes the causes of death for each of the 9 individuals that died in hospital to self-injury and the number of previous hospitalizations due to self-injury before suicide.

Table 14. *Causes of Death and the Number of Previous Hospitalizations due to Self-Injury before Suicide.*

Individual	E-Code	Cause of Death	Accompanying Cause of Death	Number of Previous Hospitalizations due to Self-Injury before Completed Suicide
1	E9530	Hanging		0
2	E9506	Agricultural and Horticultural Chemical and Pharmaceutical Preparations Other than Plant Foods and Fertilizers		1
3	E9503	Tranquilizers and Other Psychotropic Agents		2
4	E9554	Other and Unspecified Firearm		0
5	E9500	Analgesics, Antipyretics and Antirheumatics		0
6	E9503	Tranquilizers and Other Psychotropic Agents		1
7	E9502	Other Sedatives and Hypnotics		0
8	E9530	Hanging		0
9	E9504/E 9503	Other and Specified Drugs and Medicaments	Tranquilizers and Other Psychotropic Agents	1

Referring to the above table, prior to suicide the following individuals had been hospitalized for self-injury using the following methods: individual 2 with analgesics, antipyretics and antirheumatics, individual 3 for cutting twice, individual 6 with analgesics, antipyretics and antirheumatics and individual 9 with other and specified drugs and medicaments and tranquilizers and other psychotropic agents.

Causes of Self-Injury

The 3 most common causes of the first hospitalization due to self-injury were analgesics, antipyretics or antirheumatics, tranquilizers or other psychotropic drugs and other specified drugs. The 3 most common causes of the second hospitalization due to self-injury were tranquilizers or other psychotropic drugs, analgesics, antipyretics or antirheumatics, and other specified drugs, again all of which are drug related. The same order persists for the 3 most common causes of the third hospitalization due to self-injury which were tranquilizers or other psychotropic drugs, analgesics, antipyretics or antirheumatics, and other specified drugs. The 3 most common reasons of the fourth hospitalization due to self-injury were tranquilizers or other psychotropic drugs, cutting and analgesics, antipyretics or antirheumatics. Finally, 3 most common causes of the fifth hospitalization due to self-injury were analgesics, antipyretics or antirheumatics and cutting tied for the most common cause, tranquilizers or other psychotropic drugs and other specified drugs. The causes of the first to fifth hospitalizations due to self-injury are summarized in Figures 2 to 6.

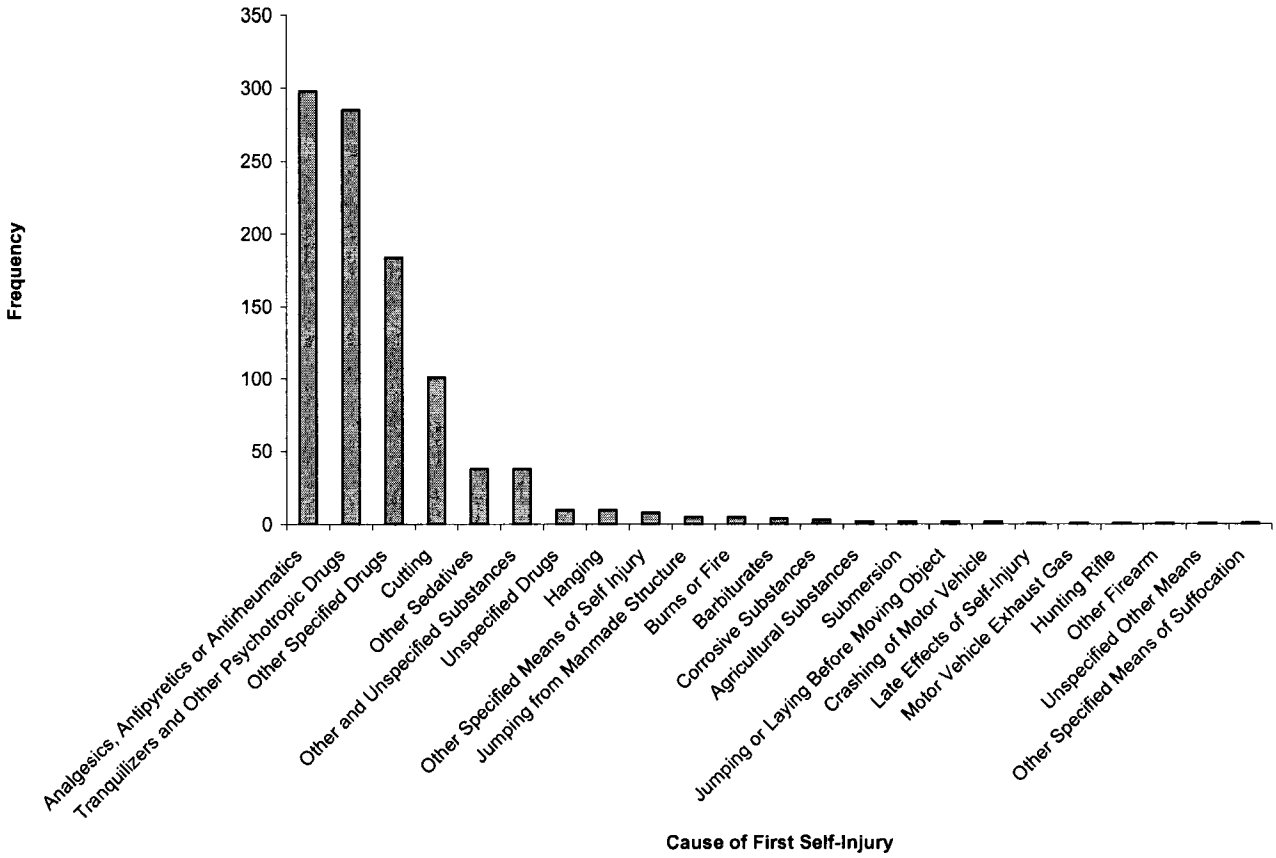

Figure 2. Frequency of causes of first hospitalization due to self-injury.

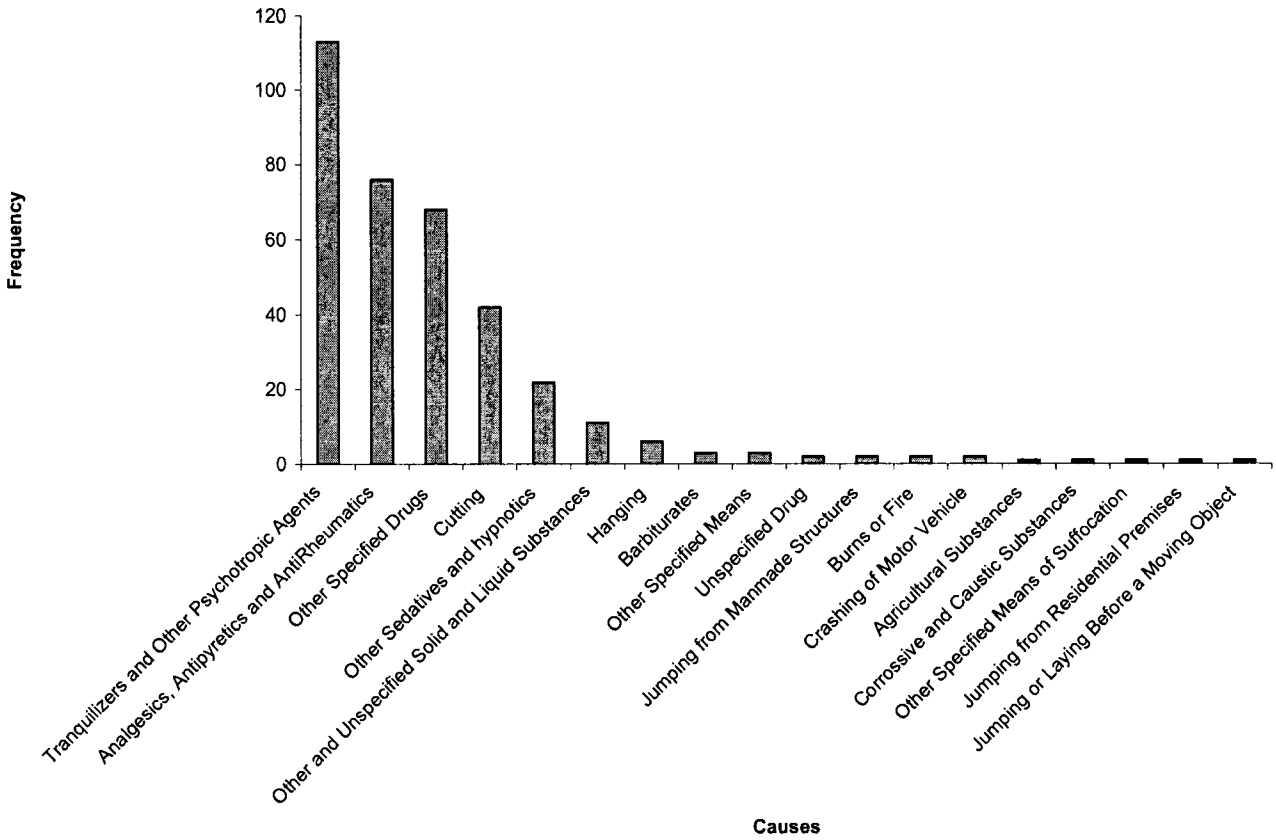

Figure 3. Frequency of causes of second hospitalization due to self-injury.

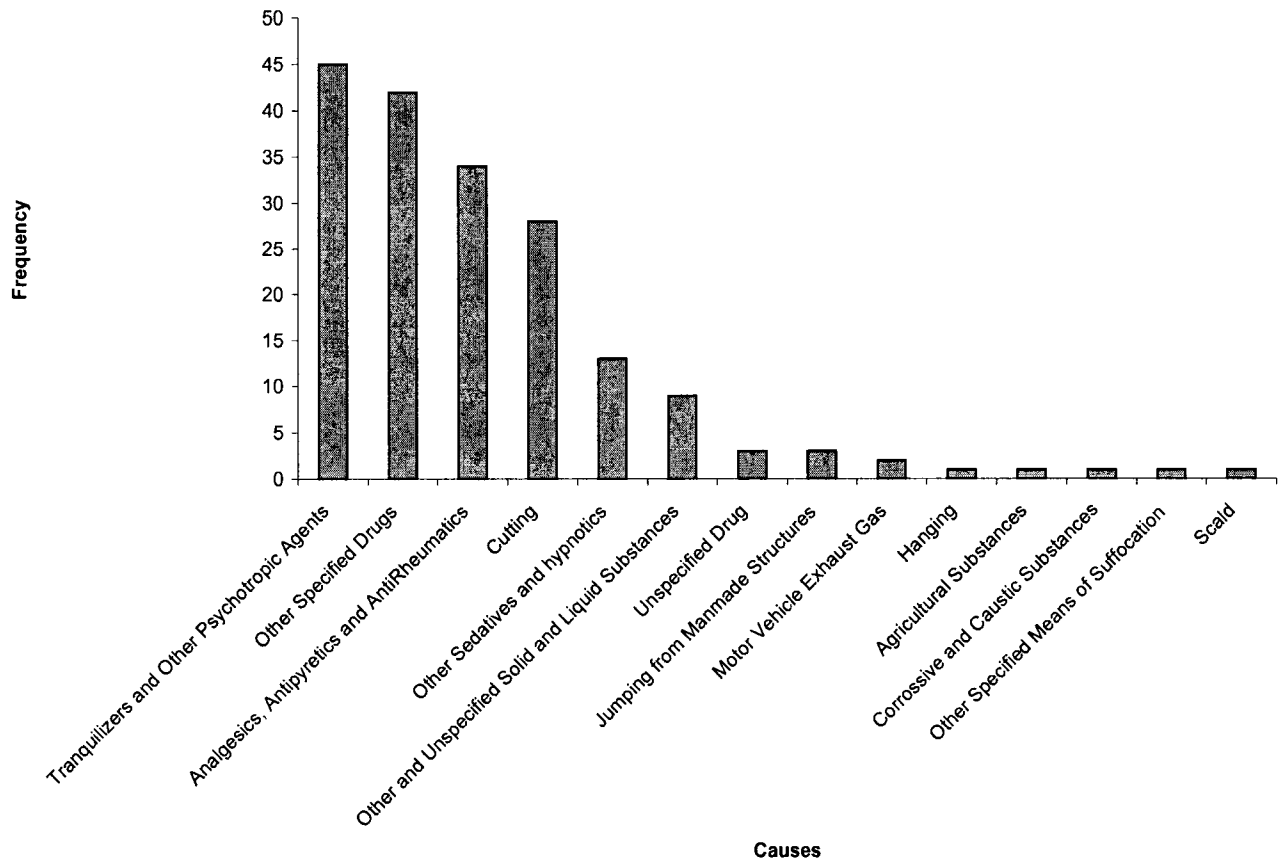

Figure 4. Frequency of causes of third hospitalization due to self-injury.

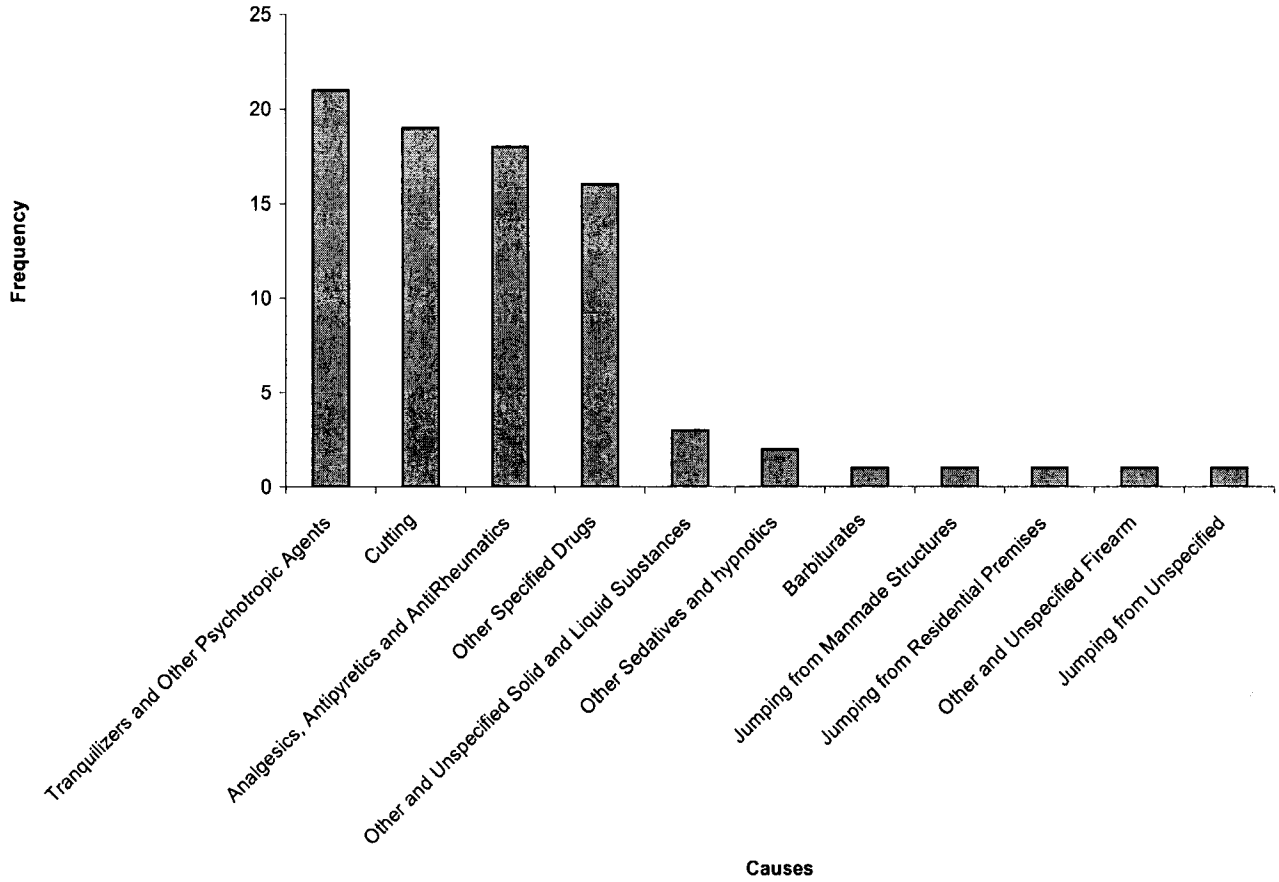

Figure 5. Frequency of causes of fourth hospitalization due to self-injury.

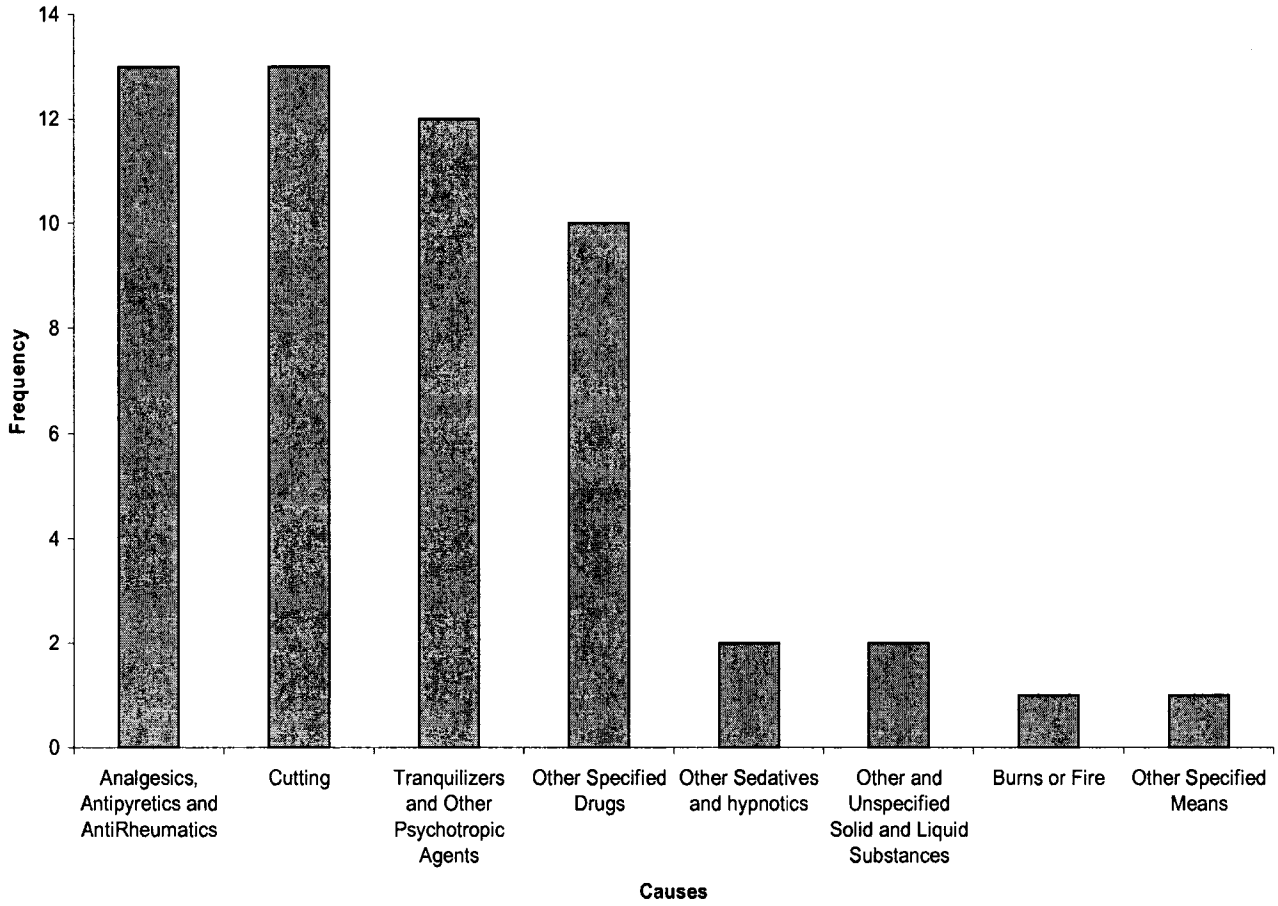

Figure 6. Frequency of causes of fifth hospitalization due to self-injury.

Demographics

Age

The first demographic characteristic of the cohort that was studied was age. The age of the cohort ranged from 0.10 to 24.98 years. The age distribution is shown in figure 7.

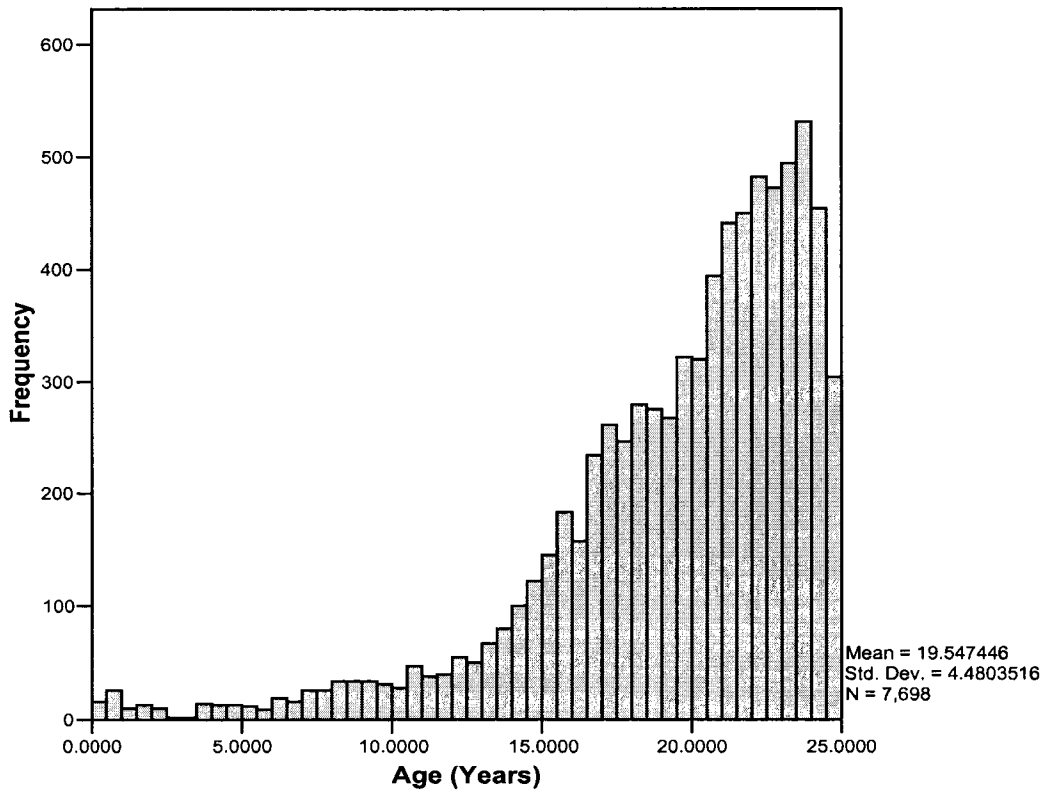

Figure 7. Histogram of the age of the depressed youth, in years.

According to the Mann-Whitney U-Test, there was no significant difference in the age of those that did and did not self-injure (Z=-1.854, p=0.064).

Sex

The second demographic characteristic of the population studied was sex. There were 5804 females in the study constituting 75.4% of the total population, while 1894 males constituted the remaining 24.6% of the population. A chi-square test for goodness of fit showed that the ratio of females to males among depressed youth, under 25 years of age population was higher than what would be expected by chance, in the fiscal year of 1991/1992 (χ^2=1985.983, df=1, p<0.0005).

A chi-square test of independence was conducted to evaluate whether self-injury and gender were independent. A significant result showed that gender and self-injury were not independent (χ^2 with continuity correction=7.312, df=1, p=0.007) and females (which comprised of 75.4% of the population and 79.2% of the population that self-injured) self-injured more than males (which comprised of 24.6% of the population and 20.8% of the population that self-injured). Table 15 illustrates the number of males and females in the study population stratified by those that did and did not self-injure.

Table 15. *Number of Females and Males in the Study Stratified By Those That Did Not Self-Injure and Those That Self-Injured At Least Once.*

	Did Not Self-Injure	Self-Injure	Row Totals
Male (N=1894)	22.3% (N=1719)	2.3% (N=175)	24.6% (N=1894)
Female (N=5804)	66.7% (N=5136)	8.7% (N=668)	75.4% (N=5804)
Column Totals	89.0% (N=6855)	11.0% (N=843)	100.0% (N=7698)

Next, incidence rates for self-injury were calculated by gender. Incidence rate, in this case, is a direct estimate of the probability, or risk of self-injury among males and females in this cohort (Lilienfeld & Stolley, 1994). The gender specific incidence rate per fiscal year was calculated using the following equation:

$$\text{Gender Specific Incidence Rate} = \frac{\text{Total number of new self-injuries per gender per fiscal year}}{\text{Total study population of that gender per fiscal year}}$$

In nearly every fiscal year (except 1995/1996 and 1999/2000), females had a higher average rate of self-injury than males. Also, the crude incidence rate of self-injury seems to decline as the study period continues. The 95% confidence intervals of the crude incidence rates for males and females overlap for every year except 1991/1992 and 1995/1996. These data are summarized in Figure 8.

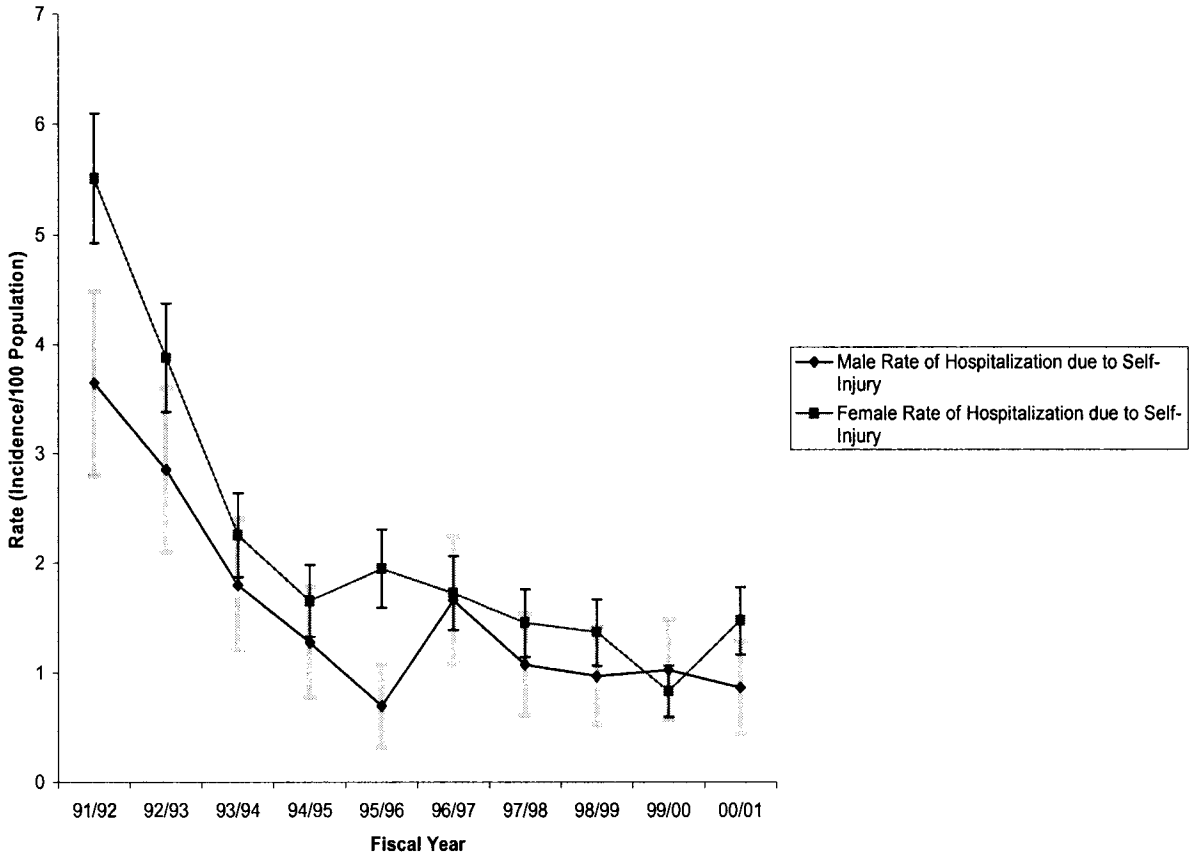

Figure 8. Rate of hospitalization due to self-injury per year, stratified by gender with 95% confidence interval error bars.

Health Authority

The effect of residency on self-injury was studied by analyzing the differences in self-injury among health authorities. The health authority in which an individual lived was determined from the individual's registry file during the inception year of the study. The health authorities with the highest percentage of individuals that self-injured were Northern (16.34%), Interior (13.02%) and Vancouver Island (12.73%). The health authorities with the lowest percentage of individuals that self-injured were Vancouver Coastal (8.66%) and Fraser (10.48%). The number of individuals in each health authority

that did and did not self-injure and the percentage of individuals that self-injured are summarized in Table 16.

Table 16. *Number of Depressed Youth in Each Health Authority that Did and Did Not Self-Injure and the Percentage of Depressed Youth that Self-Injured.*

Health Authority	Number of Individuals That Did Not Self-Injure	Number of Individuals That Did Self-Injure	Percentage of Individuals That Self-Injured (%)
Northern	425	83	**16.34**
Interior	862	129	**13.02**
Vancouver Island	1076	157	**12.73**
Fraser	2410	282	**10.48**
Vancouver Coastal	1866	177	**8.66**

A chi-square test of independence was conducted to evaluate whether self-injury and the individual's health authority location were independent. A significant result showed that the individual's health authority location and self-injury were not independent (χ^2=39.542, df=5, p<0.0005). Post-hoc analysis of the independence of self-injury and the individual's health authority location was conducted utilizing chi-square tests of independence with the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.0033 because 15 chi square tests were undertaken. The results of the post-hoc analysis are summarized in Table 17.

Table 17. *Results of Post-Hoc Analysis of the Independence of Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Health Authority 1 (Total Number of individuals within health authority and Percent of Total)	Health Authority 2 (Total Number of individuals within health authority and Percent of Total)	Percentage of Individuals that Self-Injured from Health Authority 1 (and when significant which health authority had more self-injury)	χ^2	p-value (α=0.05/15)
Fraser (N=2692, 84.1%)	Northern (N=508, 15.9%)	77.3% **(Northern)**	13.963	**0.000<α**
Vancouver Coastal (N=2043, 80.1%)	Northern (N=508, 19.9%)	68.1% **(Northern)**	25.349	**0.000<α**
Vancouver Coastal (N=2043, 62.4%)	Vancouver Island (N=1233, 37.6%)	53.0% **(Vancouver Island)**	13.467	**0.000<α**
Interior (N=991, 32.7%)	Vancouver Coastal (N=1866, 67.3%)	42.2% **(Interior)**	13.47	**0.000<α**
Northern (N=508, 70.1%)	Out of Province (N=217, 29.9%)	85.6% **(Northern)**	11.986	**0.001<α**
Interior (N=991, 82.0%)	Out of Province (N=217, 18.0%)	90.20%	6.737	0.009>α
Vancouver Island (N=1233, 85%)	Out of Province (N=217, 15%)	91.80%	6.409	0.011>α
Interior (N=991, 26.9%)	Fraser (N=2692, 73.1%)	31.40%	4.467	0.035>α
Fraser (N=2692, 56.9%)	Vancouver Coastal (N=1866, 43.1%)	61.40%	4.151	0.042>α
Fraser (N=2692, 68.6%)	Vancouver Island (N=1233, 31.4%)	64.20%	4.115	0.043>α

Vancouver Island (N=1233, 70.8%)	Northern (N=508, 29.2%)	65.40%	3.673	0.056>α
Fraser (N=2692, 92.5%)	Out of Province (N=217, 7.5%)	95.30%	3.131	0.077>α
Interior (N=991, 66.1%)	Northern (N=508, 33.9%)	60.80%	2.784	0.095>α
Interior (N=991, 44.6%)	Vancouver Island (N=1233, 55.4%)	45.10%	0.018	0.893>α
Vancouver Coastal (N=2043, 90.4%)	Out of Province (N=217, 9.6%)	92.70%	0.971	0.324>α

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in the Northern health authority (comprising 15.9% of the population and 77.3% of the self-injury population of the two health authorities that were compared) than the Fraser health authority (χ^2=13.963, df=1, p<0.0005); in the Northern health authority (comprising 19.9% of the population and 68.1% of the self-injury population of the two health authorities that were compared) than the Vancouver Coastal health authority (χ^2=25.349, df=1, p<0.0005);); in the Vancouver Island health authority (comprising 37.6% of the population and 53.0% of the self-injury population of the two health authorities that were compared) than the Vancouver Coastal health authority (χ^2=13.467, df=1, p<0.0005); in the Interior health authority (comprising 32.7% of the population and 42.2% of the self-injury population of the two health authorities that were compared) than the Vancouver Coastal health authority (χ^2=13.470, df=1, p<0.0005 in the Northern health authority (comprising 70.1% of the population and 85.6% of the self injury population of the two health authorities that were compared) than the Out of Province System (χ^2=13.470, df=1, p=0.001).

Percentage of Aboriginals in the Local Health Authority

The next demographic factor studied in terms of self-injury was the percentage of Aboriginals in the local health authority in which the youth resided in 1991/1992. A chi-square test of independence was conducted to see if self-injury and the percentage of Aboriginals in the individual's local health authority were independent. A significant result showed that the self-injury and the percentage of Aboriginals in the individual's local health authority were not independent (χ^2=54.266, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the percentage of Aboriginals in the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 18.

Table 18. *Results of Post-Hoc Analysis of the Independence of Percentage of Aboriginals in the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Aboriginal Percentage (N=3755, 66.9%)	Medium Aboriginal Percentage (1861, 33.1%)	57.0% **(Medium)**	26.766	**0.000<α**
Low Aboriginal Percentage (N=3755, 67.1%)	High Aboriginal Percentage (N=1840, 32.9%)	45.6% **(High)**	47.509	**0.000<α**
Medium Aboriginal Percentage (N=1861, 50.3%)	High Aboriginal Percentage (N=1840, 49.7%)	53.0%	1.906	0.167>α

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a medium Aboriginal presence (comprising 33.1% of the population and 57.0% of the self-injury population of the two groups that were compared) than among individuals in areas with a low Aboriginal presence (χ^2=26.766, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a high Aboriginal presence (comprising 32.9% of the population and 45.6% of the self-injury population of the two groups that were compared) than among individuals in areas with a low Aboriginal presence (χ^2=47.509, df=1, p<0.0005).

Percentage of Visible Minorities in the Health Service Distribution Area

The final demographic factor studied in terms of self-injury was the percentage of visible minorities as a whole in the youth's health service delivery area. A chi-square test of independence was conducted to see if self-injury and the percentage of visible minorities in the individual's health service delivery area were independent. A significant result showed that the self-injury and the percentage of visible minorities in the individual's health service delivery area were not independent (χ^2=36.125, df=2, $p<0.0005$). Post-hoc analysis of the independence of self-injury and the percentage of visible minorities in the individual's health service delivery area was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 19.

Table 19. *Results of Post-Hoc Analysis of the Independence of Percentage of Visible Minorities in the Individual's Health Service Delivery Area and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Percentage of Visible Minorities (N=2732, 54.0%)	Medium Percentage of Visible Minorities (2330, 46.0%)	58.6% **(Low)**	5.921	**0.015<α**
Low Percentage of Visible Minorities (N=2732, 53.2%)	High Percentage of Visible Minorities (N=2405, 46.8%)	65.1% **(Low)**	35.693	**0.000<α**
Medium Percentage of Visible Minorities (N=2330, 49.2%)	High Percentage of Visible Minorities (N=2405, 50.8%)	56.9% **(Medium)**	11.579	**0.001<α**

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low presence of visible minorities (comprising 54.0% of the population and 58.6% of the self-injury population of the two groups that were compared) than among individuals in areas with a medium presence of visible minorities (χ^2=5.921, df=1, p=0.015). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a low presence of visible minorities (comprising 53.2% of the population and 65.1% of the self-injury population of the two groups that were compared) than among individuals in areas with a high presence of visible minorities (χ^2=35.693, df=1, p<0.0005). Finally,

in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a medium presence of visible minorities (comprising 49.2% of the population and 56.9% of the self-injury population of the two groups that were compared) than among individuals in areas with a high presence of visible minorities (χ^2=11.579, df=1, p=0.001).

Summary of Demographic Factors

Despite not being significant in univariate analysis, age was included in the regression analysis because it is an important covariate in regression analyses in the social sciences. Sex, Aboriginal presence and presence of visible minorities were all found to be significant in the univariate analysis, so they were included in the regression analysis.

Socioeconomic Factors

Population Size of Local Health Authority

The first socioeconomic factor studied in terms of self-injury was the population size of the youths' local health authority. A chi-square test of independence was conducted to see if self-injury and the population size of the individual's local health authority were independent. A significant result showed that the self-injury and the population size of the individual's local health authority were not independent (χ^2=18.173, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the population size of the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value

was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 20.

Table 20. *Results of Post-Hoc Analysis of the Population Size of the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Population Size (N=2290, 47.3%)	Medium Population Size (2547, 52.7%)	49.1%	0.722	0.396>α
Low Population Size (N=2290, 46.6%)	High Population Size (N=2619, 53.4%)	55.0% **(Low)**	16.286	**0.000<α**
Medium Population Size (N=2547, 49.3%)	High Population Size (N=2619, 50.7%)	56.0% **(Medium)**	10.340	**0.001<α**

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low population size (comprising 46.6% of the population and 55.0% of the self-injury population of the two groups that were compared) than among individuals in areas with a high population size (χ^2=16.286, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a medium population size (comprising 49.3% of the population and 56.0% of the self-injury population of the

two groups that were compared) than among individuals in areas with a high population size (χ^2=10.340, df=1, p=0.001).

Population Density of Local Health Authority

The second socioeconomic factor studied in terms of self-injury was the population density (measured as population size per square kilometer) of the local health authority that the individual is from. A chi-square test of independence was conducted to see if self-injury and the population density of the individual's local health authority were independent. A significant result showed that the self-injury and the population density of the individual's local health authority were not independent (χ^2=35.594, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the population density of the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 21.

Table 21. *Results of Post-Hoc Analysis of the Population Density of the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Population Density (N=2422, 49.1%)	Medium Population Density (2513, 50.9%)	57.3% **(Low)**	17.939	**0.000<α**
Low Population Density (N=2422, 49.0%)	High Population Density (N=2521, 51.0%)	60.0% **(Low)**	30.709	**0.000<α**
Medium Population Density (N=2513, 49.9%)	High Population Density (N=2521, 50.1%)	52.8%	1.641	0.200>α

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low population density (comprising 49.1% of the population and 57.3% of the self-injury population of the two groups that were compared) than among individuals in areas with a medium population density (χ^2=17.939, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a low population density (comprising 49.0% of the population and 60.0% of the self-injury population of the two groups that were compared) than among individuals in areas with a high population density (χ^2=30.709, df=1, p<0.0005).

Percentage of Lone Parent Families in the Local Health Authority

The next socioeconomic factor studied in terms of self-injury was the percentage of families with children that had a lone parent in the local health authority that the individual is from. A chi-square test of independence was conducted to see if self-injury and the percentage of lone parent families in the individual's local health authority were independent. A significant result showed that the self-injury and the percentage of lone parent families in the individual's local health authority were not independent (χ^2=27.926, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the percentage of lone parent families in the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 22.

Table 22. *Results of Post-Hoc Analysis of the Independence of Percentage of Lone parent Families in the Individual's Local health authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Presence of Lone Parent Families (N=2920, 54.8%)	Medium Presence of Lone Parent Families (2410, 46.0%)	58.1%	2.522	0.112>α
Low Presence of Lone Parent Families (N=2920, 57.9%)	High Presence of Lone Parent Families (N=2126, 42.1%)	50.8% **(High)**	13.621	**0.000<α**
Medium Presence of Lone Parent Families (N=2410, 53.1%)	High Presence of Lone Parent Families (N=2126, 46.9%)	42.7% **(High)**	25.253	**0.000<α**

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a high presence of lone parent families (comprising 42.1% of the population and 50.8% of the self-injury population of the two groups that were compared) than among individuals in areas with a low presence of lone parent families (χ^2=13.621, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a high presence of lone parent families (comprising 46.9% of the population and 42.7% of the self-injury population of the two groups that were compared) than among

individuals in areas with a high presence of lone parent families (χ^2=25.253, df=1, p<0.0005).

Average Census Family Income in Local Health Authority

The next socioeconomic factor studied in terms of self-injury was the average census family income of the local health authority that the individual is from. A chi-square test of independence was conducted to see if self-injury and the average annual income of census families in the individual's local health authority were independent. A significant result showed that the self-injury and the average annual income of census families in the individual's local health authority were not independent (χ^2=16.081, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the average annual income of census families in the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 23.

Table 23. *Results of Post-Hoc Analysis of the Independence of the Average Annual Income of Census Families in the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Average Annual Census Family Income (N=2544, 52.6%)	Medium Average Annual Census Family Income (2293, 47.4%)	54.1%	0.536	0.464>α
Low Average Annual Census Family Income (N=2544, 49.3%)	High Average Annual Census Family Income (N=2619, 50.7%)	57.0% **(Low)**	14.592	**0.000<α**
Medium Average Annual Census Family Income (N=2293, 46.7%)	High Average Annual Census Family Income (N=2619, 53.3%)	53.0% **(Medium)**	8.674	**0.003<α**

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low average annual census family income (comprising 49.3% of the population and 57.0% of the self-injury population of the two groups that were compared) than among individuals in areas with a high average annual census family income (χ^2=14.592, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a medium average annual census family income (comprising 46.7% of the population and 53.0% of the self-injury population of the two groups that

were compared) than among individuals in areas with a high average annual census family income (χ^2=8.674, df=1, p=0.003).

Average Female Lone Parent Income in Local Health Authority

The next socioeconomic factor studied in terms of self-injury was the average female lone parent income of the local health authority that the individual is from. A chi-square test of independence was conducted to see if self-injury and the average annual income of female lone parents in the individual's local health authority were independent. A significant result showed that the self-injury and the average annual income of female lone parents in the individual's local health authority were not independent (χ^2=40.094, df=2, p<0.0005). Post-hoc analysis of the independence of self-injury and the average annual income of female lone parents in the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 24.

Table 24. *Results of Post-Hoc Analysis of the Independence of the Average Annual Income of Female Lone Parents in the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Average Annual Female Lone Parent Income (N=2435, 49.5%)	Medium Average Annual Female Lone Parent Income (2489, 50.5%)	57.2% **(Low)**	16.173	**0.000<α**
Low Average Annual Female Lone Parent Income (N=2435, 49.0%)	High Average Annual Female Lone Parent Income (N=2532, 51.0%)	61.1% **(Low)**	36.924	**0.000<α**
Medium Average Annual Female Lone Parent Income (N=2489, 49.6%)	High Average Annual Female Lone Parent Income (N=2532, 50.4%)	54.10%	4.091	0.043>α

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low average annual female lone parent income (comprising 49.5% of the population and 57.2% of the self-injury population of the two groups that were compared) than among individuals in areas with a medium average annual female lone parent income (χ^2=16.173, df=1, p<0.0005). Also, in the same post-hoc analysis, there was significantly more self-injury among the individuals in areas with a low average annual female lone parent income (comprising 49.0% of the population and 61.1% of the self-injury population of the two

groups that were compared) than among individuals in areas with a high average annual female lone parent income (χ^2=36.924, df=1, p<0.0005).

Percentage of Population 15 Years of Age or Older with Post Secondary Qualifications in Local Health Authority

The final socioeconomic factor studied in terms of self-injury was the percentage of the population 15 years of age or older with post secondary qualifications (Diploma of University Degree) in the local health authority that the individual is from. A chi-square test of independence was conducted to see if self-injury and the percentage of the population 15 years or older that had post secondary qualifications in the individual's local health authority were independent. A significant result showed that the self-injury and the percentage of the population 15 years or older that had post secondary qualifications in the individual's local health authority were not independent (χ^2=10.045, df=2, p=0.007). Post-hoc analysis of the independence of self-injury and the percentage of the population 15 years or older that had post secondary qualifications in the individual's local health authority was conducted utilizing chi-square tests of independence utilizing the Bon Ferroni Correction. As a result the α value was reduced from 0.05 to 0.017. The results of the post-hoc analysis are summarized in Table 25.

Table 25. *Results of Post-Hoc Analysis of the Independence of the Percentage of the Population 15 years or Older that had Post Secondary Qualifications in the Individual's Local Health Authority and Self-Injury Utilizing Chi-Square Tests of Independence.*

Area 1 (Total Number of individuals within area and Percent of Total)	Area 2 (Total Number of individuals within area and Percent of Total)	Percentage of Individuals that Self-Injured from Area 1 (and when significant which area had more self-injury)	χ^2	p-value (α=0.05/3)
Low Percentage of the Population 15 Years or Older with Post Secondary Qualifications (N=2436, 49.4%)	Medium Percentage of the Population 15 Years or Older with Post Secondary Qualifications (2496, 50.6%)	52.8%	2.983	0.084>α
Low Percentage of the Population 15 Years or Older with Post Secondary Qualifications (N=2436, 49.1%)	High Percentage of the Population 15 Years or Older with Post Secondary Qualifications (N=2524, 50.9%)	55.4% **(Low)**	9.650	**0.002<α**
Medium Percentage of the Population 15 Years or Older with Post Secondary Qualifications (N=2496, 49.7%)	High Percentage of the Population 15 Years or Older with Post Secondary Qualifications (N=2524, 50.3%)	52.6%	1.794	0.180>α

The post-hoc chi-square analysis with Bon Ferroni correction showed that there was significantly more self-injury among the individuals in areas with a low percentage of the population 15 years or older with post secondary qualifications (comprising 49.1% of the population and 55.4% of the self-injury population of the two groups that were

compared) than among individuals in areas with a high percentage of the population with post secondary qualifications (χ^2=9.650, df=1, p=0.002).

Summary of Socioeconomic Factors

Due to their significance in the univariate analyses, the following were included in the regression analysis: population size, population density, percentage of lone parent families, average census family income, average female lone parent income and percentage of population 15 years of age or older with post secondary qualifications.

Medical Services Plan (MSP) Records

In British Columbia, the Medical Services Plan (MSP) provides public insurance for medically required services supplied by physicians and other health care practitioners, laboratory services and diagnostic procedures for residents of British Columbia (Medical Services Plan Homepage, 2005). Through utilization of the MSP files of each individual, records were available of each time the individual accessed the healthcare system. As a result, every MSP diagnosis the individual had received was counted over the 10 year study period and totaled.

MSP Diagnostic Categories

When physicians submit claims to the Medical Services Plan, they must include a diagnostic category. These categories are based on the ninth revision of the International Classification of Diseases (ICD9) codes created by the World Health Organization (Medical Services Plan Homepage, 2005). Using these categories, the differences in

diagnoses of individuals that did and did not self-injure when they accessed the health care system during the study period could be studied.

The difference in diagnoses between those that did and did not self-injure were explored using the Mann-Whitney U test. These results are summarized in Table A2, found in Appendix A. According to the Mann-Whitney U tests, the group that self-injured had a higher number of diagnoses of infection ($Z=-10.683$, $p<0.005$), endocrine disorders ($Z=-3.883$, $p<0.005$), blood diseases ($Z=-4.490$, $p<0.005$), mental disorders ($Z=-20.667$, $p<0.005$), nervous system disorders ($Z=-5.097$, $p<0.005$), circulatory disorders ($Z=-5.762$, $p<0.005$), respiratory disorders ($Z=-5.085$, $p<0.005$), digestive disorders ($Z=-10.725$, $p<0.005$), genitourinary disorders ($Z=-5.526$, $p<0.005$), skin disorders ($Z=-3.846$, $p<0.005$), symptoms and ill-defined ($Z=-11.488$, $p<0.005$) and injuries ($Z=-13.400$, $p<0.005$). According to the Mann-Whitney U test, the group that did not self-injure had a higher number of diagnoses of musculoskeletal disorders ($Z=-2.247$, $p=0.025$),

The three most common diagnoses for depressed youth were for mental disorders, infection and symptoms and ill-defined. For illustrative purposes only, the mean frequency over the 10 year study period of the diagnoses of the groups that did and did not self-injure that had been found to be significantly different are summarized in Figure 9.

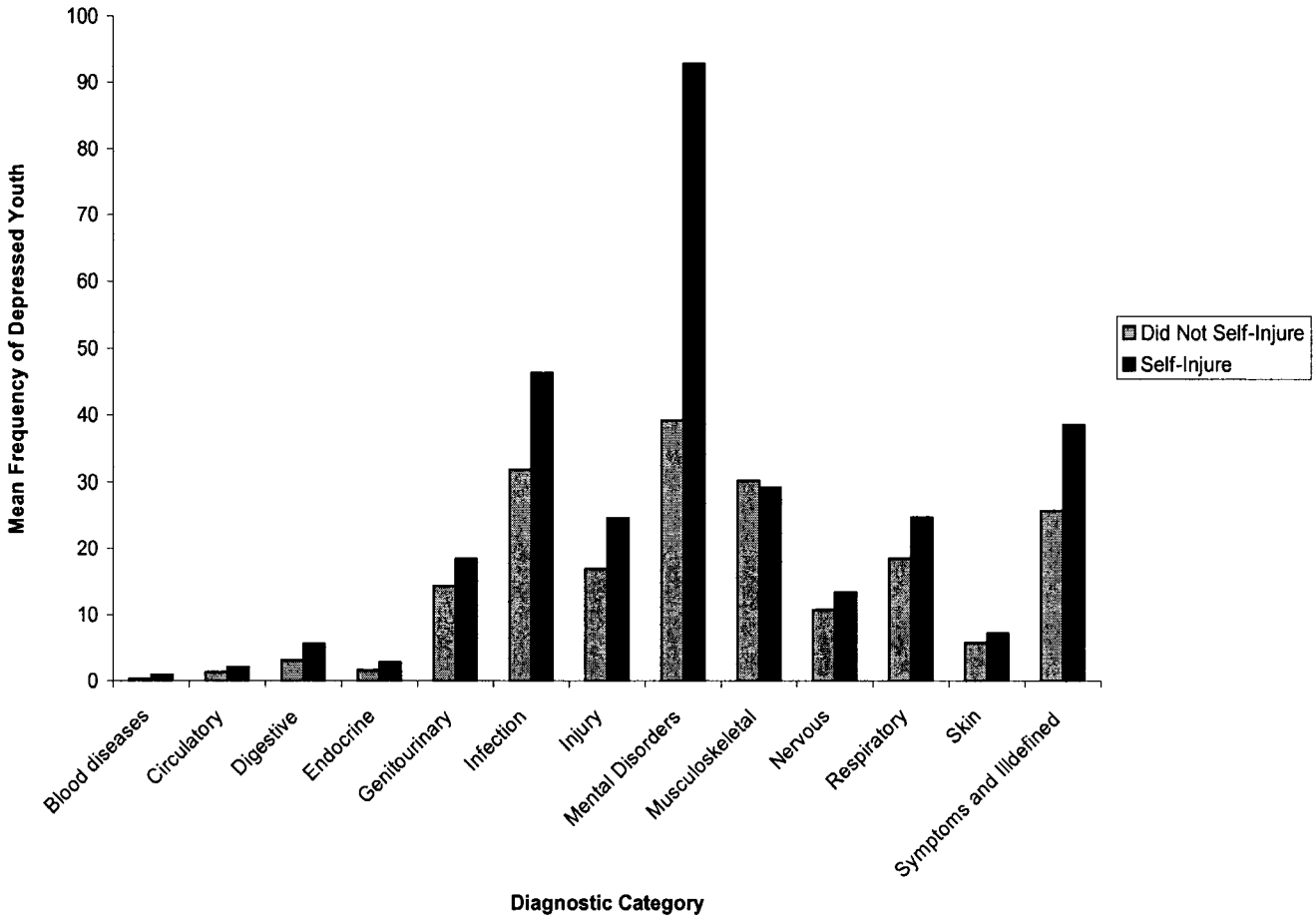

Figure 9. Mean frequency of diagnostic categorization per depressed youth during hospitalization stratified by those who did and did not self-injure.

MSP Health Care Provider Types

When physicians submit claims to the Medical Services Plan, they must include a specialty category (Medical Services Plan Homepage, 2005). Using these categories, the differences in the types of health care providers seen by individuals that did and did not self-injure when they accessed the health care system during the study period could be studied.

The differences in the type of healthcare providers visited by those that did and did not self-injure were explored using the Mann-Whitney U test. These results are summarized in Table B2, found in Appendix B. According to the Mann-Whitney U tests, the group that self-injured were seen more than the group the did not self-injure by general practitioners ($Z=-14.807$, $p<0.0005$), neurologists ($Z=-6.735$, $p<0.0005$), psychiatrists ($Z=-20.205$, $p<0.0005$), neuro-psychiatrists ($Z=-3.933$, $p<0.0005$), obstetricians and gynecologists ($Z=-3.888$, $p<0.0005$), general surgeons ($Z=-8.008$, $p<0.0005$), orthopeadic surgeons ($Z=-2.713$, $p<0.0005$), plastic surgeons ($Z=-3.162$, $p<0.0005$), urologists ($Z=-5.298$, $p<0.0005$), internal medicine doctors ($Z=-15.866$, $p<0.0005$), radiologists ($Z=-8.758$, $p<0.0005$), cardio and thoracic surgeons ($Z=-3.335$, $p=0.001$), pathologists ($Z=-10.993$, $p<0.0005$), anaestheticians ($Z=-9.583$, $p<0.0005$), emergency medicine doctors ($Z=-11.981$, $p<0.0005$), medical microbiologists ($Z=-4.330$, $p<0.0005$), nuclear medicine doctors ($Z=-5.774$, $p<0.0005$), oral surgeons ($Z=-3.773$, $p<0.0005$), dental surgeons ($Z=-3.118$, $p=0.002$), registered nurses ($Z=-5.657$, $p<0.0005$), licensed practical nurses ($Z=-3.063$, $p=0.002$), medical office assistants ($Z=-3.091$, $p=0.002$) and pharmacists ($Z=-3.091$, $p=0.002$). For illustrative purposes only, the mean frequency of visits to the various health care providers by the groups that did and did not self-injure that had been found to be significantly different are summarized in Figure 10.

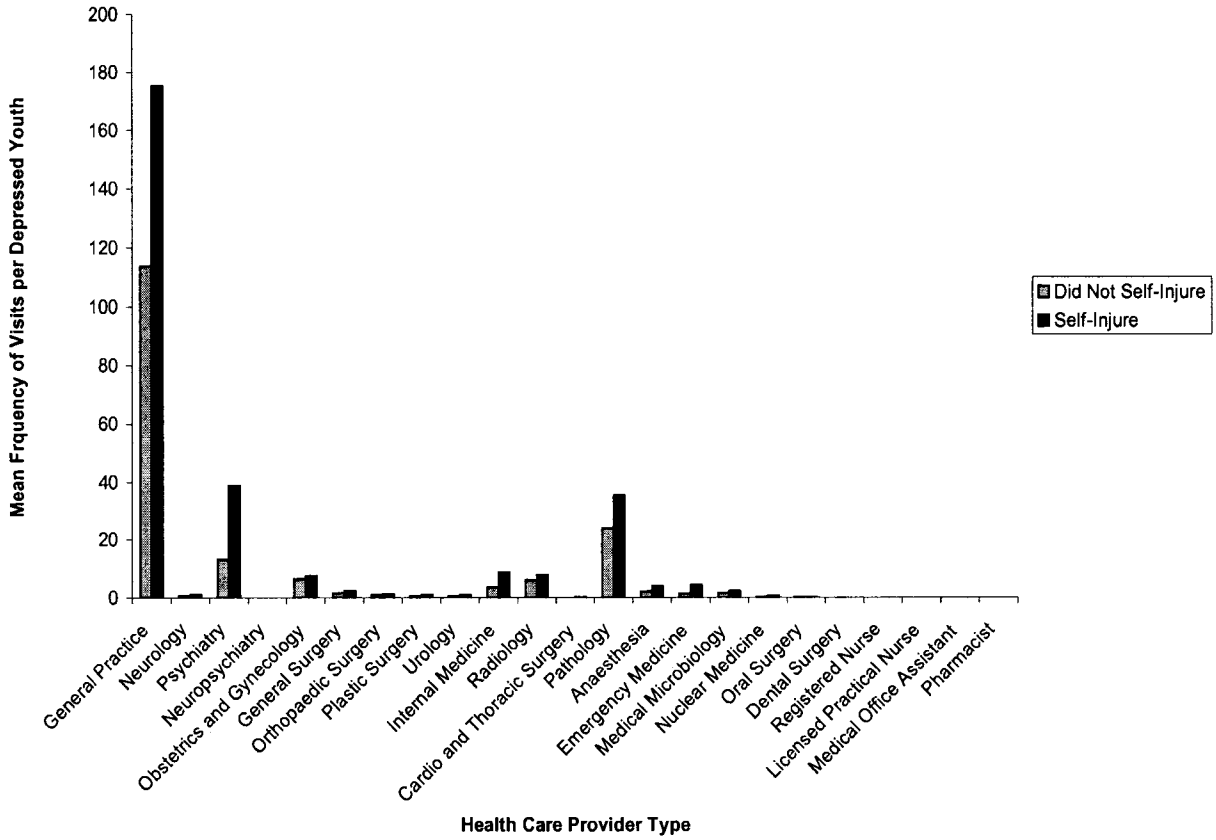

Figure 10. Mean frequency of visits to a health care provider type per depressed youth stratified by those who did and did not self-injure.

Summary of MSP Record Analyses

Due to their significance in the univariate analyses, the following MSP diagnostic categories were included in the regression analysis: blood diseases, circulatory, digestive, endocrine, genitourinary, infection, injury, mental disorders, musculoskeletal, nervous, respiratory, skin and symptoms and ill-defined. None of the MSP health care provider types were included in the regression analysis because the health care provider type is chosen as part of treatment, while the goal of the study is to identify high risk youth so that they could receive optimum treatment.

Linked Parental Medical Services Plan (MSP) Records

Along with the MSP data for the depressed youth, MSP data linked to 1157 parents of the depressed youth cohort could be examined. Through utilization of the MSP files of each individual, records of each time the individual accessed the healthcare system were available. As a result, every MSP diagnosis the parent had received was counted over the 10 year study period and totaled. Of these parents, 107 had children that self-injured and 1050 had children that did not self-injure. These parents were divided into two groups, the first being "parents of children that self-injured" and the second being "parents of children that did not self-injure". None of this data was used in the logistic regression analysis, because there were not enough parent data to match to the youth data.

Linked Parental MSP Diagnostic Categories

The MSP diagnostic categories of the parents were used to study the differences in diagnoses of the parents of individuals that did and did not self-injure. The difference in diagnoses between the parents of children that did and did not self-injure were explored using the Mann-Whitney U test. These results are summarized in Table C2 in Appendix C. According to the Mann-Whitney U tests, the group that self-injured had a higher number of diagnoses of infections ($Z=-2.364$, $p=0.018$), neoplasms ($Z=-2.454$, $p=0.014$), blood diseases ($Z=-1.992$, $p=0.046$), pregnancies ($Z=-1.964$, $p=0.050$) and injuries ($Z=-51.981$, $p=0.048$).

The three largest mean diagnostic categories for the parents of depressed youth who did and did not self-injure are for injuries, neoplasms and infection. For illustrative purposes only, the means of the diagnoses of the groups that did and did not self-injure that had been found to be significantly different are summarized in Figure 11.

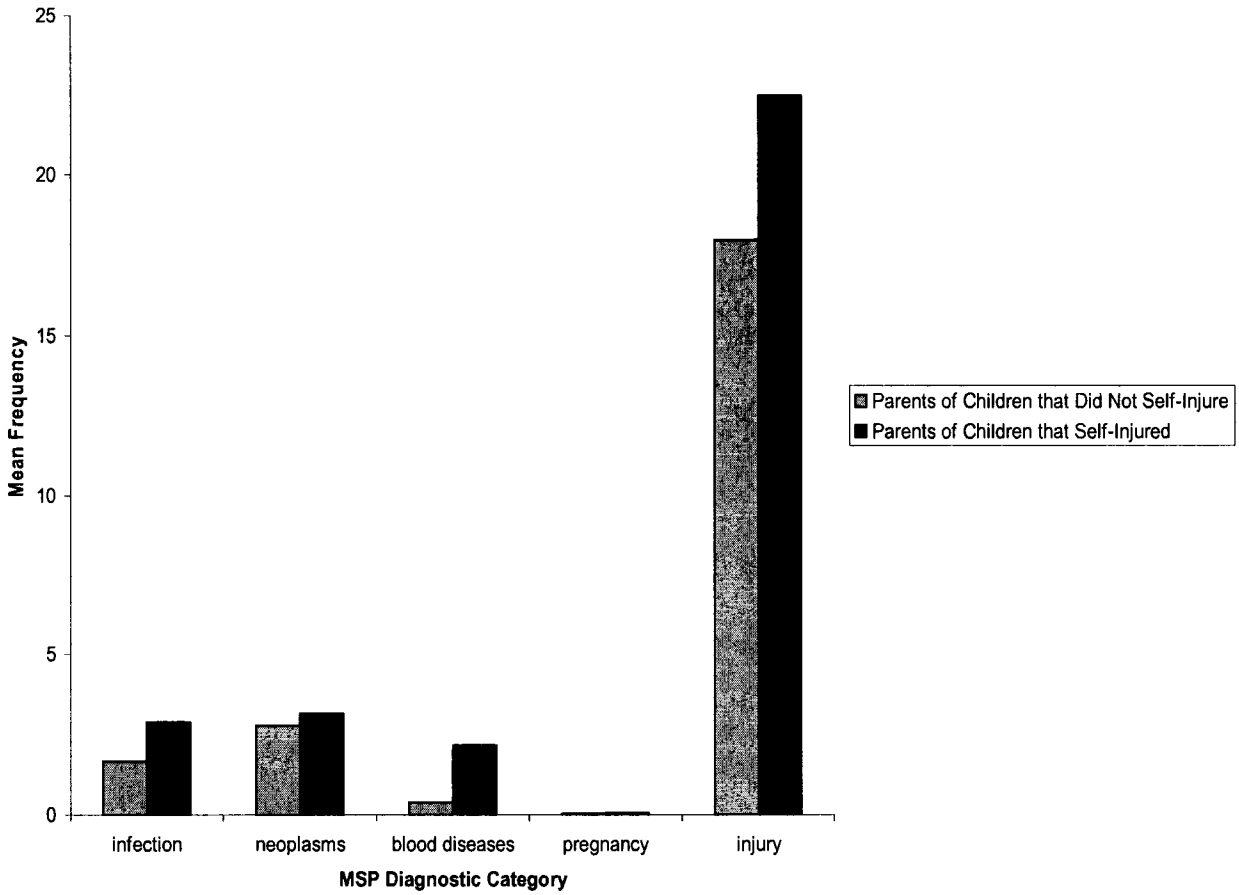

Figure 11. Mean frequency of diagnostic categorization per parent of depressed youth during hospitalization stratified by those whose children did and did not self-injure.

Linked Parental MSP Health Care Provider Types

The MSP health care provider data of the parents were used to study the differences in the type of health care providers seen by parents of individuals that did and did not self-injure. The differences in the type of healthcare providers visited by the parents of youth that did and did not self-injure were explored using the Mann-Whitney U test. These results are summarized in Table D2, found in the Appendix D. According to the Mann-Whitney U tests, more of the parents of the youth that self-injured were seen by massage therapists ($Z=-2.530$, $p=0.011$) than were the parents of the children that did not self-injure. Also, according to the Mann-Whitney U tests, the parents of children that did not self-injure were seen by more naturopaths ($Z=-2.019$, $p=0.044$) than the parents of the children that self-injured. For illustrative purposes only, the mean frequency of visits to the various health care providers by the parents of children that did and did not self-injure that had been found to be significantly different are summarized in Figure 12.

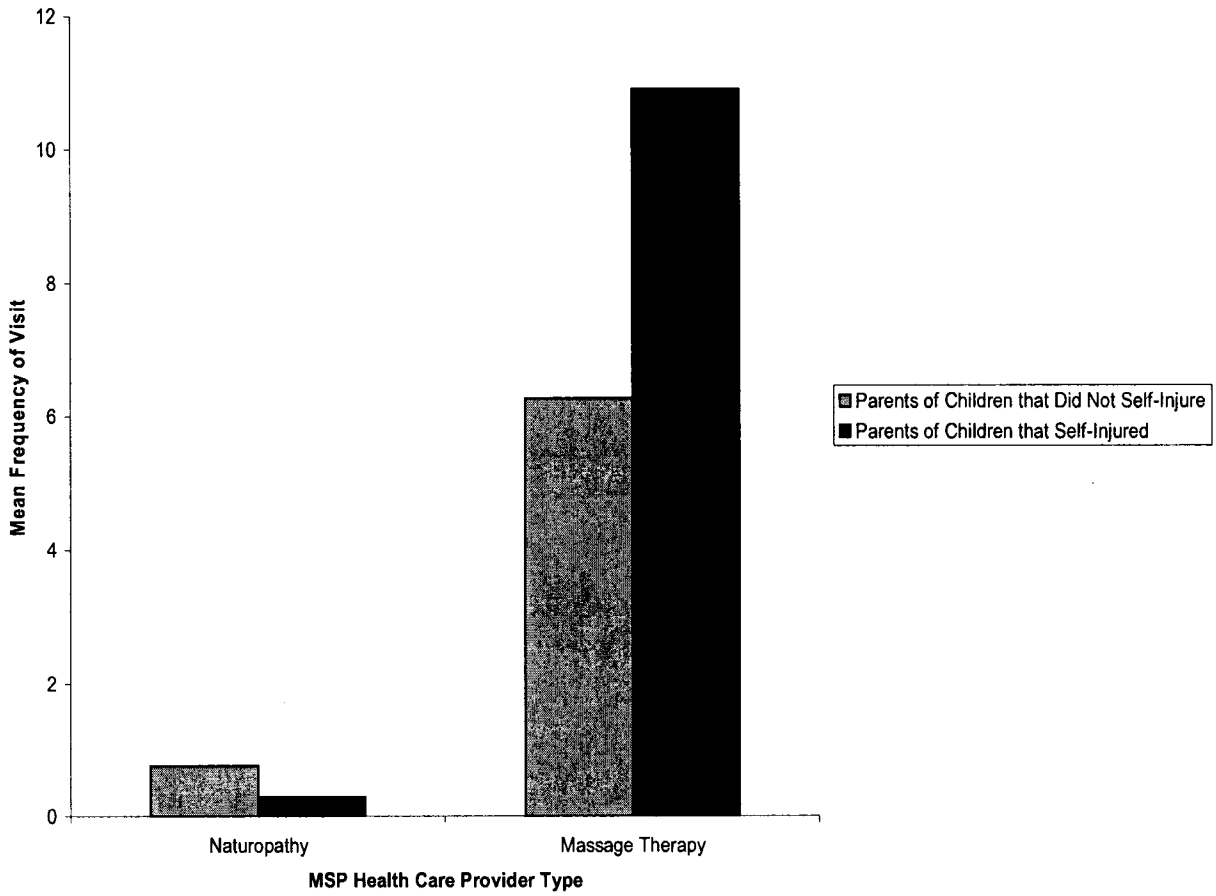

Figure 12. Mean frequency of visits to a health care provider type per depressed youth stratified by those who did and did not self-injure.

Linked Parental MSP Health Care Services

The MSP health care services data of the parents were used to study the differences in the type of health care services utilized by parents of individuals that did and did not self-injure.

The differences in the type of health care services received by the parents of children that did and did not self-injure were explored using the Mann-Whitney U test. These results are summarized in Table E2, found in the Appendix E. According to the

Mann-Whitney U tests, the parents of children that self-injured utilized GP Emergency Visits more than the parents of children that did not self-injure. For illustrative purposes only, the mean frequency of utilization of GP Emergency Visits by the parents of the children that did and did not self-injure summarized in Figure 13.

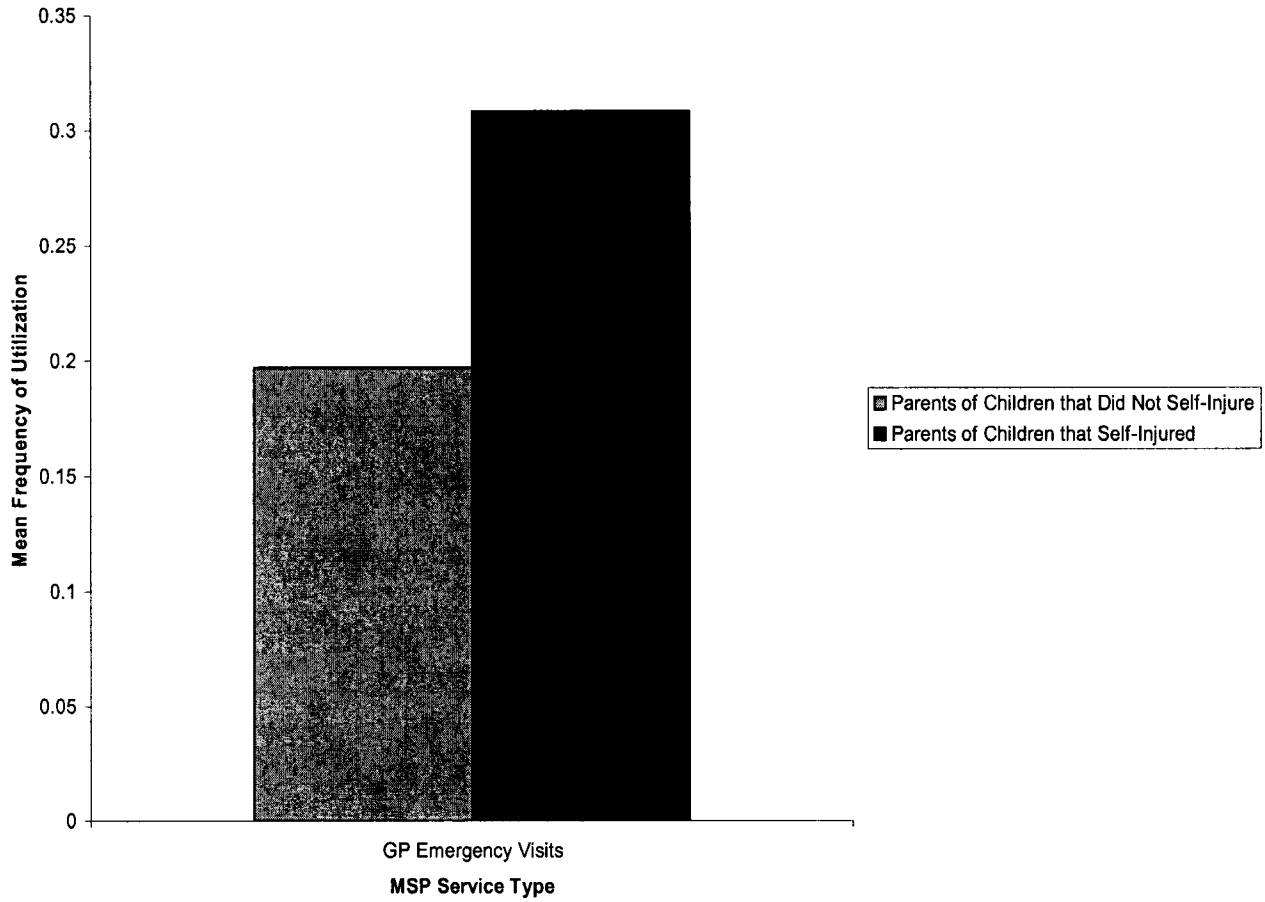

Figure 13. Mean frequency of utilization of GP Emergency Visits by parents of children that did and did not self-injure.

Logistic Regression Analysis

A logistic regression analysis was performed on self-injury as the outcome and 27 predictors: sex (male or female), age, percentage of Aboriginals in health service delivery area (high, medium or low), average income of census families in local health authority (high, medium or low), average income of female lone parents in local health authority (high, medium or low), population of local health authority (high, medium or low), population density of local health authority (high, medium or low), percentage of population over 15 years of age with post secondary qualifications in local health authority (high, medium or low), percentage of single parent families in local health authority (high, medium or low), percentage of visible minorities in health service distribution region (high, medium or low) and all of the MSP diagnostic categories including infection, neoplasm, endocrine, blood diseases, mental disorders, nervous system, circulatory, respiratory, digestive, genitourinary, pregnancy, skin, musculoskeletal, congenital abnormalities, perinatal period, symptoms and ill-defined and injury. First each predictor was put through univariate logistic regression analyses. All of the predictors that were significant on the univariate level were then run through a larger multivariate logistic regression analyses. Finally, to isolate the reliable predictors of self-injury, the predictors that were significant at the first stage multivariate level were then put into a final model.

Of the total 7698 cases, 243 were missing. The missing cases constituted less than 5% of the total cases so they were deleted. After deletion of the 243 cases, data for 7456 individuals were available for analysis: 6631 individuals that did not self-injure and 825 that did self-injure. All of the pairs of discrete variables had an expected frequency that

was greater than 5. As a result, there was no restriction on the goodness-of-fit criterion used to evaluate the model.

During further preliminary analysis, the Box-Tidwell approach for analysis of linearity of the logit was conducted for each univariate predictor. Serious violations in the assumption of linearity of the logit occurred for age, endocrine, blood diseases, mental disorders, nervous system, circulatory, digestive, genitourinary, skin, musculoskeletal, symptoms and ill-defined and injury (with an α=0.025). As a result, the natural logarithms of these predictors were used for univariate logistic regression analysis.

During the preliminary univariate screening, all of the predictors except neoplasm ($\underline{Z}$=0.062, $\underline{p}$=0.804), pregnancy ($\underline{Z}$=0.116, $\underline{p}$=0.733), congenital abnormalities ($\underline{Z}$=0.265, $\underline{p}$=0.607) and perinatal period ($\underline{Z}$=0.137, $\underline{p}$=0.711) were found to be significant (with α=0.05). As a result, the following predictors were used in the initial multivariate analysis: sex, age, percentage of Aboriginals in health service delivery area, average income of census families in local health authority, average income of female lone parents in local health authority, population of local health authority, population density of local health authority, percentage of population over 15 years of age with post secondary qualifications in local health authority, percentage of single parent families in local health authority, percentage of visible minorities in health service distribution region and the MSP diagnostic categories including infection, endocrine, blood diseases, mental disorders, nervous system, circulatory, respiratory, digestive, genitourinary, skin, musculoskeletal, symptoms and ill-defined and injury. The results of the initial univariate screening analysis can be found on Table F1, found in Appendix F.

The Box-Tidwell approach for analysis of linearity of the logit was again conducted for each predictor from the univariate model. All of the predictors were analyzed for linearity of the logit untransformed, regardless if the transformed version was used in the univariate analysis. Serious violations in the assumption of linearity of the logit occurred for age, mental disorders, musculoskeletal and injury (the α=0.00135). As a result, the natural logarithms of these predictors were used for the initial multivariate logistic regression analysis. The results of the Box-Tidwell analysis are summarized in Table F2, found in Appendix F.

Due to possible issues with multicolinearity with population density, population was not used in the multivariate model. Population density was chosen because it is felt that it better reflects rurality than population. Goodness-of-fit statistics show an excellent fit of the model by both the Deviance criterion (χ^2=4429.159, df=7426, p=1.000) and Pearson criterion (χ^2=7792.901, df=7426, p<0.0005). The variance in self-injury accounted for is 19.3% (Negelkerke's R^2=0.193). The correct classification rate for those that did not self-injure was very good at 99.6%, but was much poorer for those that self-injured at 9.5% giving an overall correct classification rate of 89.6%. Table F3 found in Appendix F, shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the 22 predictors. According to the Wald criterion (with α=0.00227), the natural logarithm of mental disorders (Z=318.981, p<0.0005), the natural logarithm of musculoskeletal disorders (Z=56.528, p<0.0005), the natural logarithm of injury (Z=125.208, p<0.0005), low average income of female lone parents in local health authority (Z=14.271, p<0.0005) and medium percentage of visible minorities in health service distribution area (Z=10.267, p=0.001) predicted self-injury in

the initial multivariate analysis. As a result, these predictors were used to form the final multivariate logistic regression model for prediction of self-injury.

For the final multivariate logistic regression model, untransformed variables were used for ease of interpretation. Goodness-of-fit statistics show an excellent fit of the model by both the Deviance criterion (χ^2=4661.602, df=7227, p=1.000) and Pearson criterion (χ^2=7773.131, df=7227, p<0.0005). The variance in self-injury accounted for 12.6% (Negelkerke's R^2=0.126). The correct classification rate for those that did not self-injure was very good at 99.3%, but was much poorer for those that self-injured at 6.9% giving an overall correct classification rate of 89.0%. Table 24 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the 6 final predictors. According to the Wald criterion (with α=0.01), mental disorders (Z=327.669, p<0.0005), injury (Z=31.307, p<0.0005), low average income of female lone parents in local health authority (Z=15.903, p<0.0005), and musculoskeletal disorders (Z=12.331, p<0.0005) predicted self-injury in the final multivariate analysis.

The odds ratios presented in Table 26 describe chance of inclusion of an individual into the self-injure group. The odds ratio for diagnoses of mental disorders (1.010) and injury (1.008) show a slight increase in risk of self-injury per visit marked with these diagnoses. Diagnoses of musculoskeletal disorders (0.997) showed a slight decrease in risk of self-injury per visit marked with this diagnosis. Finally, residing in local health authorities with low average income of female lone parents (1.691) shows a moderate change in the likelihood of predicting inclusion of an individual in the self-injury group.

Table 26. *Logistic Regression Coeffecients, Wald Statistics, Adjusted Odds Ratios (Exp(B)) and 95% Confidence Intervals for Odds Ratios for the 6 Final Multivariate Predictors of Self-Injury (α=0.01).*

Variable Name	Self Injured	Not Self-injured	Adjusted Odds Ratio	95% CI
Musculoskeletal	734	5719	**0.997**	0.995-0.998
Injury	817	6175	**1.008**	1.005-1.011
Mental disorders	824	6619	**1.010**	1.009-1.011
Low percentage of visible minorities in HSDA	307	2613	1.248	0.961-1.619
Medium percentage of visible minorities in HSDA	221	2189	1.278	1.030-1.584
High percentage of visible minorities in HSDA	297	1829	.	.
Low average income of female lone parents in LHA	346	2089	**1.691**	1.306-2.189
Medium average income of female lone parents in LHA	259	2230	1.184	0.959-1.462
High average income of female lone parents in LHA	220	2312	.	.

CHAPTER FOUR: DISCUSSION

The underlying purpose of this study was to identify risk factors that would allow health care workers and families to identify depressed youth that may self-injure. Also of interest was the means by which depressed youth self-injured and the diagnoses and health care utilization patterns of the parents of depressed youth. Due to the restriction of accessing cause of death statistics for this cohort outside of the hospital setting (the cause of death for only those youth who died in hospital from self-injury was known), this study utilized administrative and census data to analyze suicide through self-injury.

Methods of Suicide and Self-Injury

According to Langlois and Morrison (2002), the three most common methods of suicide in Canada during 1998 from greatest to least were: suffocation/hanging at 38.8%, firearms at 22.1% and drugs and medication at 13.2%. From that same study, suicide from cutting and piercing instruments was the eighth most common method at 1.6% (Lanlois & Morrison, 2002). In this study, the vast majority of self-injury was done through drugs at 79.4%, with cutting as a distant second at 12.1%. Highly lethal methods of self-injury made up a small percentage of total self-injury such as hanging/suffocation at 1.2% and firearms at 0.18%. The methods of suicide used by the general Canadian population differed from the methods of self-injury used by youth in this study.

This study was limited in that there was only information on self-injury in which the individual was hospitalized. If the individual self-injured at home and did not make it to hospital, then details around the cause of that individual's self-injury could not be

analyzed. This could be a major reason behind the difference in method of self-injury found in this study and the methods of suicide found by Langlois and Morrison (2002). Another reason in the discrepancy between the two studies were that Langlois and Morrison (2002) were studying the entire Canadian population above 10 years of age while this study focused entirely on a depressed youth population under 25 years of age. The cohort in this study might have restricted access to firearms due to their lower age levels, decreasing the number of self-injury due to firearms. Also, firearms and suffocation/hanging are highly lethal means of self-injury. The lethality of these methods would restrict the number of attempts of self-injury utilizing these methods.

As stated previously in the results section, self-injury with drugs or cutting makes up the most common methods for repeat self-injury. This highlights the need to take these events seriously by catching youth that have been hospitalized for cutting or poisoning due to drugs and giving them appropriate treatment before they cause further self-harm or even complete suicide.

Demographics

Age

As mentioned in previous studies (White & Rouse, 1997), age seemed to affect suicide rates in the population as a whole. In this study there was no difference in the age of depressed youth under 25 years that did and did not self-injure. Age was not found to be significant in univariate or multivariate models for self-injury. As a result, it is concluded that age is not a significant factor for self-injury in this cohort.

Sex

There were significantly more depressed females (75.4%) than males (24.6%) in this study, which consisted of the entire depressed youth population who accessed MSP services in British Columbia in 1991/1992 under 25 years of age. Also, females significantly self-injured more than males. Females made up 79.2% of the self-injuring population while males made up 20.8% of the self-injuring population, which is consistent with the literature (Stovall and Domino, 2003). However in the final multivariate logistic regression model, after controlling for other variables, sex alone was not a significant predictor for self-injury.

Another interesting finding was that the rate of self-injury seemed to decrease with time for both sexes. This could be due many factors. For example, individuals who self-injured may have died during the study period from self-injury leading to a decrease in self-injuring individuals. Another explanation of the decrease in rates of self-injury may be that individuals who self-injured may have received the help they needed or their depression may have resolved spontaneously, which reduced self-injury. However, these theories require more research for explanation of this phenomenon.

Health Authority

The residence of an individual, studied through each individual's health authority, was found to be a factor in whether an individual would self-injure during the study period. The Northern Health Authority had the highest percentage of individuals that self-injured (16.34%), which was a significantly higher percentage than Fraser (10.48%), Vancouver Coastal (8.66%) and Out of Province (6.54%). Also, the Interior Health

Authority had the second highest percentage of individuals that self-injured, which was significantly greater than Vancouver Coastal (8.66%) health authority. The Vancouver Island health authority had the third highest percentage of individuals that self-injured (12.73%), which was significantly greater than the Vancouver Coastal health authority (8.66%).

Further analysis was done on the relationship between self-injury and demographic and socioeconomic factors in health service delivery areas and local health authorities, which are subdivisions of health authorities. A combination of the demographic and socioeconomic factors may have lead to the differences in the percentage of individuals that self-injured in each health authority. The contribution of each demographic and socioeconomic factor to the amount of self-injury in each region was not measured and requires more research.

Percentage of Aboriginals in Local Health Authority

Due to the vast amount of literature indicating high suicide rates among Aboriginal people (Clayer & Czechowizc, 1991; Ferry, 2000; Malchy, 1997; Wilkie et al., 1998), the link between the percentage of the population that was Aboriginal in an individual's local health authority (LHA) and self-injury was studied. It was found that individuals that came from LHAs with a high or medium percentage of Aboriginals in the population had a higher percentage of self-injury than individuals from LHAs with a low percentage of Aboriginals in the population.

An important issue with the subsequent analyses of the relationship between demographic and socioeconomic factors in the health region of the individual and self-

injury is that the demographic and socioeconomic factors studied were not characteristics of the individuals themselves, but characteristics of the health region in which they reside. For example, it was found that individuals from LHAs with a high percentage of Aboriginals self-injured more than individuals from LHAs with a low percentage of Aboriginals. There is a greater chance that an individual from an area with a high percentage of Aboriginals is Aboriginal than an individual from an area with a low percentage of Aboriginals. However, there is no direct data to support whether the individual is or is not Aboriginal. All that is known is that the individual comes from an area with a higher percentage of Aboriginals. As a result, two possible explanations for the higher amount of self-injury in areas with a high or medium percentage of Aboriginals are presented here. The first explanation is that many of the individuals are Aboriginal and suffer from the social disintegration that affects tribal cultures under colonization as described by Clayer and Czechowicz (1991). The second explanation is that these areas are underprivileged from a socioeconomic point of view as described by Clarke et al. (1997), with poverty, a high amount of familial disruption and drug and alcohol abuse, which would affect non-Aboriginal individuals as well. However, in the final multivariate logistic regression model, after controlling for other variables, Aboriginal presence alone was not a significant predictor for self-injury.

Percentage of Visible Minorities in Health Service Distribution Area

There seems to be a gap in the literature concerning visible minorities and suicide in Canada. Due to the research done on connection between Aboriginal people and high suicide rates, one of the goals of the study was to determine if there was a similar link

between visible minorities as a whole and suicide. It was found that individuals that came from HSDAs with a low percentage of visible minorities had a higher percentage of self-injury than individuals that came from HSDAs with a medium or high percentage of visible minorities. Also, individuals that came from HSDAs with a medium percentage of visible minorities had a higher percentage of self-injury than individuals that came from HSDAs with a high percentage of visible minorities.

One possible explanation for these findings is that the individuals in the high percentage of visible minorities group are ethnic minorities and ethnic minorities (other than Aboriginals) might self-injure less than the rest of the population. Another explanation is that individuals (visible minority or not) from the high visible minority group came from the Richmond, Vancouver and Fraser North health service distribution areas, which are more affluent from a socioeconomic point of view than other HSDAs. According to Hawton et al. (2001), areas of greater socioeconomic deprivation exhibit increased suicide rates. However, it is not known whether the individuals in the high visible minority HSDAs are visible minorities or not. As a result, it is unknown whether this finding is a result of a trait characteristic of visible minority populations, or a result of a favourable socioeconomic environment that would benefit the entire individual population of these areas, visible minority or not. However in the final multivariate logistic regression model, after controlling for other variables, presence of visible minorities alone was not a significant predictor for self-injury.

Socioeconomic Factors

Population Size and Population Density

Population size and density will be discussed together, because they were both intended as measures of rurality. It was found that individuals that came from local health authorities (LHA) of low or medium population size had a higher amount of self-injury than LHAs of high population size. Also, it was found that individuals that came from LHAs of low population density had a higher amount of self-injury than individuals that came from LHAs with a medium or high population density. Rural areas are often characterized by a lower population size and density, while urban areas are often characterized by higher population size and density. From these results, it seems that individuals that came from rural areas self-injure more than individuals who come from urban areas. These findings are consistent with the literature on the topic, which gives the following possible reasons for the discrepancy in the self-injury rates between rural and urban areas: physical and social isolation, limited opportunity for social networking, limited employment opportunities for young people and limited access to mental health professionals (Cantor & Coory, 1993; Clayer & Czechowicz, 1991, Rost et al., 1998, Sing & Siahpush, 2002). However in the final multivariate logistic regression model, after controlling for other variables, population size and population density alone were not significant predictors for self-injury.

Percentage of Lone Parent Families in the Local Health Authority

One of the risk factors associated with suicide victims, according to the literature, was a non-intact family of origin (Anderson, 1999; Bell & Clark, 1998; Bloch, 1999;

Jellinek & Snyder, 1998; Kosky et al., 1990; Runeson, 1998; Stovall & Domino, 2003; Wilkie et al., 1998). The census data on the percentage of lone parent families in the local health authority was analyzed to see if this risk factor applied to our cohort. Our data showed that individuals that came from local health authorities with a high percentage of lone parent families had a higher amount of self-injury than individuals who came from local health authorities with a low or medium percentage of lone parent families. However, the youth's actual family status is unknown.

Separation or divorce is one of the causes of lone parent families. According to Gould et al. (1998), separation and divorce can increase the risk of psychopathologies such as depression among children which is a known risk factor for suicide. Also, separation and divorce is associated with a higher amount of suicide among parents which is also a known risk factor for suicide among youth (Gould et al., 1998).

Another cause of lone parent families is the death of a parent. According to Chen et al. (2000), a stressful life event such as the death of a parent is associated with increased suicide among youth, especially if the parent was a suicide victim.

Finally, non-marital births are another cause of lone parent families. According to Stockard and O'Brien (2002), individuals that came from cohorts with a high percentage of non-marital births had a higher risk of lifetime suicide than individuals who came from cohorts with a lower percentage of non-marital births.

All of the above literature citations concerning divorce/separation, death of parent or nonmarital births are consistent with the findings that the cohort that has a high percentage of lone parent families had a higher amount of self-injury than cohorts that had a medium or low percentage of lone parent families. However in the final

multivariate logistic regression model, after controlling for other variables, the percentage of lone parent families in the local health authority alone was not a significant predictor for self-injury.

Average Census Family Income in Local Health Authority

Socioeconomic status has been established as an important risk factor for suicide (Hawton et al., 2001). An important measure of socioeconomic status is census family income. In our study, the high average census family income cohort had a lower amount of self-injury than the low and medium average census family income cohorts. This is consistent with the literature that increased family income is associated with a lower number of suicide attempts (Cutler et al., 2001). According to Cutler et al. (2001), higher income is associated with lower levels of depression which is an important risk factor for suicide. However in the final multivariate logistic regression model, after controlling for other variables, average census family income alone was not a significant predictor for self-injury.

Average Female Lone Parent Income in Local Health Authority

As established above, children in lone parent families and children in families with low average income have an increased risk for self-injury. Since 81% of lone parent families in British Columbia in 2001 were headed by a female lone parent, it was determined what effect the average female lone parent income had on self-injury rates in local health authorities in British Columbia (BC Stats: Socio-Economic Profiles by LHA, 2005). Local health authorities with a low average female lone parent income had

significantly greater self-injury among youth than local health authorities with medium or high average female lone parent incomes. This was the only demographic/socioeconomic factor that was found to be significant in both the univariate and multivariate models. As a result, it is determined that this is one of the major risk factors for self-injury among depressed youth. The reason why low average female lone parent income is a major risk for self injury among depressed youth may be due to the combined effects of having a non-intact family of origin and the predisposition to depression caused by low income (Cutler et al., 2001; Stovall and Domino, 2003).

Percentage of Population 15 Years of Age or Older with Post Secondary Qualifications in Local Health Authority

Runeson (1998) found that people that complete suicide tend to come from families with lower levels of education. A goal of the study was to determine what effect education, by way of percentage of population 15 years of age or older with post secondary qualifications, had on self-injury among youth in local health authorities. Areas that had a low percentage of the population 15 years of age or older with post secondary qualifications had a higher self injury rate than areas with a high percentage of the population 15 years of age or older with post secondary qualifications. This is consistent with the general findings by Runeson (1998) that education would have a protective effect on self injury rates. However in the final multivariate logistic regression model, after controlling for other variables, the percentage of population 15 years of age or older with post secondary qualifications alone was not a significant predictor for self-injury.

Medical Service Plan (MSP) Records

MSP Diagnostic Categories

Through examination of MSP records, kinds of diagnoses given to youth that did and did not self-injure when they interacted with the healthcare system during the course of this study was determined. In the univariate analysis, the group that self-injured had a higher number of diagnoses of infection, endocrine disorders, blood diseases, mental disorders, nervous system disorders, circulatory disorders, respiratory disorders, digestive disorders, genitourinary disorders, skin disorders, symptoms and ill-defined diagnoses and injuries than the group that did not self-injure. The group that did not self-injure had a higher number of diagnoses of musculoskeletal disorders than the group that did self-injure. The overall poorer health status of those that self-injure may contribute to the feelings of hopelessness that may cause those youth to self-injure.

In the multivariate analysis, mental disorder and injury were the only diagnoses that were shown to be significantly related to the odds of youth belonging to the self-injury group. Increased diagnoses of mental disorders among the self-injury group were expected. As mentioned earlier, the absence of a major mental disorder among suicide victims is so rare that it is argued that co-morbid psychopathology is a characteristic of death by suicide (Bell & Clark, 1998; Bloch, 1999; Jellinek & Snyder, 1998; Tondo & Baldesserini, 2000). Our result of increased risk of belonging to the self-injury group with increased hospitalizations for injury is consistent with Conner et al. (2003) who found that increased risk of suicide was associated with hospitalizations for self-injury, injuries for undetermined causes and injuries due to assault.

Consistent with the univariate analysis, diagnoses of musculoskeletal disorders were shown to decrease the odds of youth belonging to the self-injury group in the multivariate analysis. According to Smith et al. (2004), those with musculoskeletal pain experienced more suicidal ideation than controls without musculoskeletal pain. These conflicting findings may be resolved because those diagnosed with musculoskeletal disorders may be less able to self-injure than those who are not diagnosed with musculoskeletal disorders despite having more suicidal ideation. Also, those with musculoskeletal disorders may be more likely to receive health care services than those without musculoskeletal pain.

MSP Health Care Provider Types

Through examination of MSP records, the type of health care providers that attended youth that did and did not self-injure when they interacted with the healthcare system during the course of this study was determined. In the univariate analysis, the group that self-injured were seen by a higher number of general practitioners, neurologists, psychiatrists, neuro-psychiatrists, obstetricians and gynecologists, general surgeons, orthopeadic surgeons, plastic surgeons, urologists, internal medicine doctors, radiologists, cardio and thoracic surgeons, pathologists, anaestheticians, emergency medicine doctors, medical microbiologists, nuclear medicine doctors, oral surgeons, dental surgeons, registered nurses, licensed practical nurses, medical office assistants and pharmacists.

The higher number of healthcare provider interactions with youth that self-injured in comparison to the youth that did not self-injure may be due to their lower health status

as seen by increased diagnoses of infection, endocrine disorders, blood diseases, mental disorders, nervous system disorders, circulatory disorders, respiratory disorders, digestive disorders, genitourinary disorders, skin disorders, symptoms and ill-defined diagnoses and injuries as discussed in the previous section. In every category in which there was a difference between youth that did and did not self-injure, the group that self-injured had a higher amount of physician visits.

In research related to healthcare use, persons with disabilities or chronic diseases use a wider array of healthcare services more often than the average population (Dryden et al., 2004). It seems that youth that self-injure seem to follow this pattern of high health care use. Throughout this study, youth that self-injured placed a high burden on the healthcare system being hospitalized or seen for a wide range of maladies beyond injury and mental health issues. It seemed that the youth that self-injured had a lower overall health status than youth that did not self-injure. This is illustrated by the greater amount of health care services rendered to youth that self-injured in comparison to the youth that did not self-injure. It is not clear if poor health is a contributing factor to self-injury or if self-injury is a contributing factor to poor health. Another possible explanation is that youth may be seeking care or medical attention for their self-injury issues. It is not clear which explanation or combination of explanations is most accurate, so more research needs to be done into this matter.

Linked Parental Medical Services Plan (MSP) Records

Linked Parental MSP Diagnostic Categories

Through examination of MSP records, the kinds of diagnoses given to the parents of youth that did and did not self-injure when they interacted with the healthcare system during the course of this study was determined. In the univariate analysis, the parents of the group that self-injured had a higher number of diagnoses of infections, neoplasms, blood diseases, pregnancy related issues and injuries. Lower socioeconomic status has been shown to be related to lower health status, a higher chance of nonfatal injuries and adverse pregnancy outcomes (Cubbinet al., 2000; Gazmararian et al., 1996; Hemingway et al., 1997). Also, this study has shown a link between lower socioeconomic status and increased self-injury. As a result, the connection between poorer health outcomes of the parents of the youth that self-injure and the increased amount of self-injury among the youth may be related to lower socioeconomic status.

Linked Parental MSP Health Care Provider Types

Through examination of parents' MSP records, the type of health care providers who attended the parents of youth that did and did not self-injure when they interacted with the healthcare system during the course of this study was determined. In the univariate analysis, more parents of youth that self-injured were seen by massage therapists than the parents of the youth that did self-injure. This might be related to the increased amount of injury found among parents of youth that self-injure because depending on the parents' injury they may require massage therapy. Also, the parents of youth that did not self-injure were seen by more practitioners of naturopathy than the

parents of the children that self-injured. Parents who seek naturopathic help maybe more highly educated which would result in a higher socioeconomic status lowering risk of self-injury among their children. However, no literature could be found on this topic and it requires more research.

Linked Parental MSP Services

Finally, through the examination of MSP records, the type of health care services received by the parents of youth that did and did not self-injure when they interacted with the healthcare system during the course of this study was determined. In the univariate analysis, more parents of the youth that self-injured received GP emergency visits than the parents of youth that did not self-injure. This might be related to the higher number of injuries sustained by the parents of the youth that self-injured. As mentioned earlier, a lower socioeconomic status was linked to a higher amount of nonfatal injury (Cubbin et al., 2000). Also, in this study, a lower socioeconomic status was associated with increased self-injury among the youth. As a result, the parents of the children who self-injure may come from a lower socioeconomic background.

Limitations of the Study

Caution should be exercised in interpreting the results of this study for several reasons. Firstly, this study does not measure suicide directly. It attempts to measure suicidal behaviour through deliberate self-injury.

Secondly, it may be difficult to generalize the results of the study to all youth who self-injure because only those that were hospitalized for self-injury were placed in the

self-injure group in this study. There maybe fundamental differences between youth that self-injure and are hospitalized and youth that self-injure and are not hospitalized that may not be captured by this study. One fundamental difference in the two groups would be severity of injury. If youth self-injure so severely that they die before any help arrives, they would not be hospitalized.

Next, this study design includes Medical Service Plan (MSP) billings. Other health services such as community mental health services were not captured in this study. This limits this study's ability to capture all health services utilized by depressed youth. As a result, further research with community mental health services should be conducted.

Another limitation was that the region of origin of the youth was taken from the inception year of 1991/1992. It was assumed that the region data throughout the study was the same as the inception. The study did not take into account the possibility of youth moving to different health regions during the study period.

Also, the demographic and socioeconomic data used in the study was taken from 2001 Census data. This data was linked to the 1991/1992 health region data for each individual. Since ranking was used to group each health region in terms of Census data, it was assumed that each region would stay in the same group throughout the study. For example, it was assumed that Vancouver aggregate would always be in the "high" population density grouping while Nisga'a would always be in the "low" population density grouping. The study did not take into account changes in Census data during the period of the study that would move health regions out of their assigned groupings.

Finally, another issue that may occur with the interpretation of the study data is ecological fallacy. Ecological fallacy occurs because what is true at the population level,

may not apply at the individual level leading to inappropriate conclusions (Kelsey et al., 1996). The socioeconomic indicators used in this study were related to the region the individual came from, and not the individual themselves. As a result, caution should be taken in applying these risk factors to the individuals themselves, because the risk factors maybe susceptible to ecological fallacy.

Conclusions

Despite the limitations of the study, this study was important because it linked self-injury among depressed youth to demographic, socioeconomic and health service utilization data. It was also able to link self-injury among depressed youth to the healthcare utilization of their parents. The most important conclusions of this study are the results of the multivariate logistic regression model because it identified the main factors that would predict if depressed youth would self-injure. The logistic regression model found that youth coming from a local health authority that had a low average income of female lone parents and youth who had diagnoses of mental disorders and injuries had increased odds of belonging to the self-injury group. Also, it was found that diagnoses of musculoskeletal disorders had a protective effect and decreased the odds that youth would belong to the self-injury group.

Future Research

The main limitation of this study was its inability to measure suicide directly. If cause of death information could be accessed for all the individuals that died and applied to this data, then factors that would predict completed suicide could be determined. Such

a study combined with the results of this study could help us determine not only what factors would predict who self-injures, as this study does, but also who will complete suicide.

Following the methods of self-injury utilized by the study population for the first 3 hospitalizations due to self-injury, drug related self-injury made up the top three utilized methods while cutting was the fourth most commonly used method. However by the fourth hospitalization due to self-injury, cutting had become the second most common method and by the fifth hospitalization due self-injury cutting had become tied for the most common method of self-injury. This begs the questions whether or not the same individuals are being hospitalized for cutting themselves and if they are, what makes them continue to do so?

The lack of linked parental data prevented the parental health information to be included into the logistic regression. Only 1157 parents of the depressed youth cohort were able to be found and linked to 7457 depressed youth. This number was too small for the parental data to be included into the logistic regression model. If the number of parents that could be linked to the depressed youth were larger, this would have shown if parental health was an important multivariate predictor for youth self-injury. There seems to be a gap in the literature regarding this individual that future research could examine.

It was found that youth that had a high number of diagnoses of musculoskeletal disorders were less likely to self-injure. This finding came despite findings in the literature that individuals with musculoskeletal disorders have a higher amount of suicidal ideation. This paradox needs further study.

In this study, census data was linked to health authority data to determine in an indirect way if demographic and socioeconomic factors such as Native presence had an effect on self-injury. If demographic and socioeconomic data could be collected on each of these individuals, then a direct test of the effect of these factors could be determined. For example, instead of determining if youth coming from areas that had a high Native presence increased chances of self injury, it could be determined if Native youth had increased chances of self-injury.

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APPENDIX A – Kolmogorov-Smirnov Tests of Normality and Mann-Whitney U Tests for MSP Diagnostic Categories Data

Table A1. *Results of the Kolmogorov-Smirnov Tests of Normality as Applied to the Frequency of MSP Diagnostic Categories per Individual Data.*

	Self-Injury	Kolmogorov-Smirnov(a)		
		Statistic	df	Sig.
infection	Did Not Self-Injure	.116	6855	.000
	Self-injure	.148	843	.000
neoplasm	Did Not Self-Injure	.324	6855	.000
	Self-Injure	.324	843	.000
endocrine	Did Not Self-injure	.404	6855	.000
	Self-Injure	.402	843	.000
blood diseases	Did Not Self-Injure	.433	6855	.000
	Self-Injure	.460	843	.000
mental disorders	Did Not Self-Injure	.219	6855	.000
	Self-Injure	.204	843	.000
Nervous system	Did Not Self-Injure	.215	6855	.000
	Self-Injure	.181	843	.000
circulatory	Did Not Self-Injure	.362	6855	.000
	Self-Injure	.346	843	.000
respiratory	Did Not Self-Injure	.188	6855	.000
	Self-Injure	.207	843	.000
digestive	Did Not Self-Injure	.329	6855	.000
	Self-Injure	.308	843	.000
genitourinary	Did Not Self-Injure	.272	6855	.000
	Self-injure	.206	843	.000
pregnancy	Did Not Self-Injure	.273	6855	.000
	Self-Injure	.258	843	.000
Skin	Did Not Self-Injure	.291	6855	.000
	Self-Injure	.321	843	.000
musculoskeletal	Did Not Self-Injure	.293	6855	.000
	Self-Injure	.272	843	.000
congenital abnormalities	Did Not Self-Injure	.468	6855	.000

	Self-Injure	.478	843	.000
perinatal period	Did Not Self-Injure	.460	6855	.000
	Self-Injure	.453	843	.000
symptoms and ill-defined	Did Not Self-Injure	.180	6855	.000
	Self-Injure	.191	843	.000
Injury	Did Not Self-Injure	.265	6855	.000
	Self-Injure	.225	843	.000

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Table A2. *Results of the Mann-Whitney U Tests Applied to the Difference in Frequency of MSP Diagnostic Categories between Individuals that Did and Did Not Self-Injure.*

Diagnostic Category	Groups	Mean Rank	Z	p-value
	Did Not Self-Injure (N=6855), Self-Injure (N=843)			
Infection	Did Not Self-Injure	3754.623	-10.683	**0.000**
	Self-Injure	**4621.004**		
Neoplasms	Did Not Self-Injure	3848.671	-0.108	0.914
	Self-injure	3856.244		
Endocrine	Did Not Self-Injure	3820.546	-3.883	**0.000**
	Self-Injure	**4084.940**		
Blood diseases	Did Not Self-Injure	3824.036	-4.490	**0.000**
	Self-Injure	**4056.566**		
Mental disorders	Did Not Self-Injure	3665.945	-20.667	**0.000**
	Self-injure	**5342.109**		
Nervous system	Did Not Self-Injure	3797.094	-5.907	**0.000**
	Self-Injure	**4275.650**		
Circulatory	Did Not Self-Injure	3803.400	-5.762	**0.000**
	Self-Injure	**4224.370**		
Respiratory	Did Not Self-Injure	3804.354	-5.085	**0.000**
	Self-Injure	**4216.617**		
Digestive	Did Not Self-Injure	3756.626	-10.725	**0.000**
	Self-Injure	**4604.718**		
Genitourinary	Did Not Self-Injure	3800.600	-5.526	**0.000**
	Self-Injure	**4247.136**		
Pregnancy	Did Not Self-Injure	3835.051	-1.708	0.088
	Self-Injure	3966.997		
Skin	Did Not Self-Injure	3815.535	-3.846	**0.000**
	Self-Injure	**4125.693**		
Musculoskeletal	Did Not Self-Injure	3829.581	-2.247	**0.025**
	Self-Injure	**4011.476**		
Congenital abnormalities	Did Not Self-Injure	3847.791	-0.397	0.692
	Self-Injure	3863.394		
Perinatal period	Did Not Self-Injure	3851.848	-0.461	0.645

	Self-Injure	3830.409		
Symptoms and ill-defined	Did Not Self-Injure	3747.484	-11.488	**0.000**
	Self-Injure	**4679.058**		
Injury	Did Not Self-Injure	3730.573	-13.400	**0.000**
	Self-Injure	**4816.574**		

APPENDIX B – Kolmogorov-Smirnov Tests of Normality and Mann-Whitney U Tests for MSP Specialty Type Data

Table B1. *Results of the Kolmogorov-Smirnov Tests of Normality as Applied to the Frequency of MSP Specialty Types Visited per Individual Data.*

	Self Injury	Kolmogorov-Smirnov(a)		
		Statistic	df	Sig.
General Practice	Did Not Self-Injure	.103	6855	.000
	Self-Injure	.140	843	.000
Dermatology	Did Not Self-Injure	.407	6855	.000
	Self-Injure	.428	843	.000
Neurology	Did Not Self-Injure	.397	6855	.000
	Self-Injure	.357	843	.000
Psychiatry	Did Not Self-Injure	.342	6855	.000
	Self-Injure	.302	843	.000
Neuropsychiatry	Did Not Self-Injure	.518	6855	.000
	Self-Injure	.524	843	.000
Obstetrics and Gynecology	Did Not Self-Injure	.294	6855	.000
	Self-Injure	.289	843	.000
Ophthalmology	Did Not Self-Injure	.385	6855	.000
	Self-Injure	.361	843	.000
Otolaryngology	Did Not Self-Injure	.405	6855	.000
	Self-Injure	.397	843	.000
General Surgery	Did Not Self-Injure	.400	6855	.000
	Self-Injure	.366	843	.000
Neurosurgery	Did Not Self-Injure	.512	6855	.000
	Self-Injure	.524	843	.000
Orthopaedic Surgery	Did Not Self-Injure	.412	6855	.000
	Self-Injure	.386	843	.000
Plastic Surgery	Did Not Self-Injure	.454	6855	.000
	Self-Injure	.406	843	.000
Urology	Did Not Self-Injure	.458	6855	.000
	Self-Injure	.414	843	.000
Paediatrics	Did Not Self-Injure	.442	6855	.000
	Self-Injure	.423	843	.000
Internal Medicine	Did Not Self-Injure	.427	6855	.000

	Self-Injure	.355	843	.000
Radiology	Did Not Self-Injure	.155	6855	.000
	Self-Injure	.165	843	.000
Cardio and Thoracic Surgery	Did Not Self-Injure	.518	6855	.000
	Self-Injure	.514	843	.000
Pathology	Did Not Self-Injure	.147	6855	.000
	Self-Injure	.159	843	.000
Anaesthesia	Did Not Self-Injure	.295	6855	.000
	Self-Injure	.304	843	.000
Paediatric Cardiology	Did Not Self-Injure	.513	6855	.000
	Self-Injure	.512	843	.000
Physical Medicine and Rehab	Did Not Self-Injure	.510	6855	.000
	Self-Injure	.511	843	.000
Public Health	Did Not Self-Injure	.500	6855	.000
	Self-Injure	.527	843	.000
Occupational Medicine	Did Not Self-injure	.513	6855	.000
	Self-Injure	.515	843	.000
Geriatric Medicine	Did Not Self-Injure	.508	6855	.000
Emergency Medicine	Did Not Self-Injure	.351	6855	.000
	Self-Injure	.372	843	.000
Medical Microbiology	Did Not Self-Injure	.322	6855	.000
	Self-Injure	.338	843	.000
Chiropractor	Did Not Self-Injure	.322	6855	.000
	Self-Injure	.323	843	.000
Naturopathy	Did Not Self-Injure	.453	6855	.000
	Self-Injure	.449	843	.000
Physical Therapy	Did Not Self-Injure	.356	6855	.000
	Self-injure	.327	843	.000
Nuclear Medicine	Did Not Self-Injure	.406	6855	.000
	Self-Injure	.368	843	.000
Osteopathy	Did Not Self-Injure	.514	6855	.000
	Self-Injure	.519	843	.000
Oral Surgery	Did Not Self-Injure	.533	6855	.000
	Self-Injure	.525	843	.000
Podiatry	Did Not Self-Injure	.468	6855	.000
	Self-Injure	.463	843	.000

Optometry	Did Not Self-Injure	.202	6855	.000
	Self-Injure	.197	843	.000
Dental Surgery	Did Not Self-Injure	.535	6855	.000
	Self-Injure	.533	843	.000
Oral Medicine	Did Not Self-Injure	.508	6855	.000
Orthodontia	Did Not Self-Injure	.507	6855	.000
Massage Therapy	Did Not Self-Injure	.380	6855	.000
	Self-Injure	.376	843	.000
Rheumatology	Did Not Self-Injure	.517	6855	.000
	Self-Injure	.520	843	.000
Vascular Surgery	Did Not Self-Injure	.513	6855	.000
	Self-Injure	.523	843	.000
Registered Nurse	Did Not Self-Injure	.512	6855	.000
	Self-Injure	.513	843	.000
Nutritionist or Dietitian	Did Not Self-Injure	.505	6855	.000
Counsellor	Did Not Self-Injure	.506	6855	.000
Licensed Practical Nurse	Did Not Self-Injure	.507	6855	.000
	Self-Injure	.519	843	.000
Medical Office Assistance	Did Not Self-Injure	.505	6855	.000
	Self-Injure	.516	843	.000
Nurse Practitioner	Did Not Self-Injure	.507	6855	.000
	Self-Injure	.513	843	.000
Pharmacist	Did Not Self-Injure	.507	6855	.000
	Self-Injure	.518	843	.000
Out of Country Practitioner	Did Not Self-Injure	.475	6855	.000
	Self-Injure	.512	843	.000

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Table B2. *Results of the Mann-Whitney U Tests Applied to the Difference in Frequency of MSP Health Care Provider Visits between Individuals that Did and Did Not Self-Injure.*

MSP Health Care Provider Type	Group	Mean Rank	Z	p-value
General Practice	Did Not Self-Injure **Self-Injure**	3717.974 **4919.024**	-14.807	**0.000**
Dermatology	Did Not Self-Injure Self-Injure	3859.989 3764.210	-1.406	0.160
Neurology	Did Not Self-Injure **Self-Injure**	3806.004 **4203.198**	-6.735	**0.000**
Psychiatry	Did Not Self-Injure **Self-Injure**	3675.656 **5263.144**	-20.205	**0.000**
Neuropsychiatry	Did Not Self-Injure **Self-Injure**	3845.730 **3880.160**	-3.933	**0.000**
Obstetrics and Gynecology	Did Not Self-Injure **Self-Injure**	3816.522 **4117.665**	-3.888	**0.000**
Ophthalmology	Did Not Self-Injure Self-Injure	3847.165 3868.485	-0.326	0.745
Otolaryngology	Did Not Self-Injure Self-Injure	3849.553 3849.072	-0.008	0.994
General Surgery	Did Not Self-Injure **Self-Injure**	3790.613 **4328.352**	-8.008	**0.000**
Neurosurgery	Did Not Self-Injure Self-Injure	3844.514 3890.047	-1.903	0.057
Orthopaedic Surgery	Did Not Self-Injure **Self-injure**	3831.995 **3991.843**	-2.713	**0.007**
Plastic Surgery	Did Not Self-Injure **Self-Injure**	3830.865 **4001.032**	-3.162	**0.002**
Urology	Did Not Self-Injure **Self-Injure**	3822.963 **4065.294**	-5.298	**0.000**
Paediatrics	Did Not Self-Injure Self-Injure	3847.308 3867.325	-0.373	0.709
Internal Medicine	Did Not Self-Injure **Self-Injure**	3714.820 **4944.670**	-15.866	**0.000**
Radiology	Did Not Self-Injure	3771.955	-8.758	**0.000**

	Self-Injure	**4480.072**		
Cardio and Thoracic Surgery	Did Not Self-Injure	3841.661	-3.335	**0.001**
	Self-Injure	**3913.244**		
Pathology	Did Not Self-Injure	3751.877	-10.993	**0.000**
	Self-Injure	**4643.342**		
Anaesthesia	Did Not Self-Injure	3767.230	-9.583	**0.000**
	Self-Injure	**4518.494**		
Paediatric Cardiology	Did Not Self-Injure	3849.667	-0.209	0.835
	Self-Injure	3848.138		
Physical Medicine and Rehab	Did Not Self-Injure	3847.583	-0.590	0.555
	Self-Injure	3865.088		
Public Health	Did Not Self-Injure	3850.116	-0.292	0.770
	Self-Injure	3844.493		
Occupational Medicine	Did Not Self-Injure	3849.176	-0.513	0.608
	Self-Injure	3852.133		
Geriatric Medicine	Did Not Self-Injure	3849.684	-0.607	0.544
	Self-Injure	3848.000		
Emergency Medicine	Did Not Self-Injure	3755.172	-11.981	**0.000**
	Self-Injure	**4616.542**		
Medical Microbiology	Did Not Self-Injure	3813.655	-4.330	**0.000**
	Self-Injure	**4140.977**		
Chiropractor	Did Not Self-Injure	3847.843	-0.204	0.838
	Self-Injure	3862.972		
Naturopathy	Did Not Self-Injure	3848.990	-0.099	0.921
	Self-Injure	3853.648		
Physical Therapy	Did Not Self-Injure	3838.758	-1.292	0.196
	Self-Injure	3936.846		
Nuclear Medicine	Did Not Self-Injure	3813.444	-5.774	**0.000**
	Self-Injure	**4142.693**		
Osteopathy	Did Not Self-Injure	3850.155	-0.608	0.543
	Self-Injure	3844.170		
Oral Surgery	Did Not Self-Injure	3835.708	-3.773	**0.000**
	Self-Injure	**3961.652**		
Podiatry	Did Not Self-Injure	3849.216	-0.059	0.953
	Self-Injure	3851.807		

Optometry	Did Not Self-Injure Self-Injure	3836.581 3954.550	-1.494	0.135
Dental Surgery	Did Not Self-Injure **Self-Injure**	3840.245 **3924.760**	-3.118	**0.002**
Oral Medicine	Did Not Self-Injure Self-Injure	3849.684 3848.000	-0.607	0.544
Orthodontia	Did Not Self-Injure Self-Injure	3849.746 3847.500	-0.701	0.483
Massage Therapy	Did Not Self-Injure Self-Injure	3855.102 3803.947	-0.783	0.434
Rheumatology	Did Not Self-Injure Self-Injure	3846.398 3874.726	-1.608	0.108
Clinical Immunization and Allergy	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Medical Genetics	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Vascular Surgery	Did Not Self-Injure Self-Injure	3848.289 3859.345	-1.356	0.175
Thoracic Surgery	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Midwives of BC	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Registered Nurse	Did Not Self-Injure **Self-Injure**	3843.729 **3896.431**	-5.657	**0.000**
Nutritionist or Dietitian	Did Not Self-Injure Self-Injure	3849.561 3849.000	-0.351	0.726
Counsellor	Did Not Self-Injure Self-Injure	3849.684 3848.000	-0.607	0.544
Educator	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Licensed Practical Nurse	Did Not Self-Injure **Self-injure**	3848.185 **3860.195**	-3.063	**0.002**
Medical Office Assistance	Did Not Self-Injure **Self-Injure**	3848.561 **3857.132**	-3.091	**0.002**
Nurse Practitioner	Did Not Self-Injure Self-Injure	3849.308 3851.065	-0.448	0.654

Respiratory Therapist	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Home Support	Did Not Self-Injure Self-Injure	3849.500 3849.500	0.000	1.000
Pharmacist	Did Not Self-Injure **Self-Injure**	3848.184 **3860.198**	-3.064	**0.002**
Out of Country Practitioner	Did Not Self-Injure Self-Injure	3852.168 3827.807	-0.756	0.450

APPENDIX C – Kolmogorov-Smirnov Tests of Normality and Mann-Whitney U Tests for Parental MSP Diagnostic Categories Data

Table C1. *Results of the Kolmogorov-Smirnov Tests of Normality as Applied to the Frequency of MSP Diagnostic Categories per Linked Parent of Individual Data.*

	Self-Injury	Kolmogorov-Smirnov(a)		
		Statistic	df	Sig.
Infection	Parents of Children that Did Not Self-Injure	.379	1050	.000
	Parents of Children that Self-Injured	.396	107	.000
Neoplasms	Parents of Children that Did Not Self-Injure	.386	1050	.000
	Parents of Children that Self-Injured	.327	107	.000
endocrine	Parents of Children that Did Not Self-Injure	.371	1050	.000
	Parents of Children that Self-Injured	.343	107	.000
blood diseases	Parents of Children that Did Not Self-Injure	.464	1050	.000
	Parents of Children that Self-Injured	.457	107	.000
mental disorders	Parents of Children that Did Not Self-Injure	.350	1050	.000
	Parents of Children that Self-Injured	.335	107	.000
nervous system	Parents of Children that Did Not Self-Injure	.213	1050	.000
	Parents of Children that Self-Injured	.279	107	.000
circulatory	Parents of Children that Did Not Self-Injure	.315	1050	.000
	Parents of Children that Self-Injured	.296	107	.000
respiratory	Parents of Children that Did Not Self-Injure	.309	1050	.000
	Parents of Children that Self-Injured	.239	107	.000
digestive	Parents of Children that Did Not Self-Injure	.338	1050	.000
	Parents of Children that Self-Injured	.270	107	.000

genitourinary	Parents of Children that Did Not Self-Injure	.419	1050	.000
	Parents of Children that Self-Injured	.439	107	.000
pregnancy	Parents of Children that Did Not Self-Injure	.524	1050	.000
	Parents of Children that Self-Injured	.535	107	.000
skin	Parents of Children that Did Not Self-Injure	.291	1050	.000
	Parents of Children that Self-Injured	.314	107	.000
musculoskeletal	Parents of Children that Did Not Self-injure	.270	1050	.000
	Parents of Children that Self-Injured	.289	107	.000
congenital abnormalities	Parents of Children that Did Not Self-Injure	.491	1050	.000
	Parents of Children that Self-Injured	.521	107	.000
symptoms_and_ill-defined	Parents of Children that Did Not Self-Injure	.523	1050	.000
perinatal period	Parents of Children that Did Not Self-Injure	.214	1050	.000
	Parents of Children that Self-Injured	.213	107	.000
injury	Parents of Children that Did Not Self-Injure	.280	1050	.000
	Parents of Children that Self-Injured	.245	107	.000

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Table C2. *Results of the Mann-Whitney U Tests Applied to the Difference in Frequency of MSP Diagnostic Categories between Parents of Individuals that Did and Did Not Self-Injure.*

Diagnostic Category	Groups Parents of Children that Did Not Self-Injure (N=1050) Parents of Children that Self-Injured (N=107)	Mean Rank	Z	p-value
infection	Parents of Children that Did Not Self-Injure	572.402	-2.364	**0.018**
	Parents of Children that Self-Injured	**643.743**		
neoplasms	Parents of Children that Did Not Self-Injure	572.172	-2.454	**0.014**
	Parents of Children that Self-Injured	**646.000**		
endocrine	Parents of Children that Did Not Self-Injure	576.750	-0.778	0.437
	Parents of Children that Self-Injured	601.079		
blood diseases	Parents of Children that Did Not Self-Injure	575.822	-1.992	**0.046**
	Parents of Children that Self-Injured	**610.187**		
mental disorders	Parents of Children that Did Not Self-Injure	575.902	-1.011	0.312
	Parents of Children that Self-Injured	609.402		
nervous system	Parents of Children that Did Not Self-Injure	579.869	-0.278	0.781
	Parents of Children that Self-Injured	570.472		
circulatory	Parents of Children that Did Not Self-Injure	582.766	-1.229	0.219
	Parents of Children that Self-Injured	542.042		
respiratory	Parents of Children that Did Not Self-Injure	579.264	-0.085	0.932
	Parents of Children that Self-Injured	576.407		

digestive	Parents of Children that Did Not Self-Injure	575.716	-1.121	0.262
	Parents of Children that Self-Injured	611.229		
genitourinary	Parents of Children that Did Not Self-Injure	574.733	-1.425	0.154
	Parents of Children that Self-Injured	620.869		
pregnancy	Parents of Children that Did Not Self-Injure	577.480	-1.964	**0.050**
	Parents of Children that Self-Injured	**593.921**		
skin	Parents of Children that Did Not Self-Injure	573.749	-1.720	0.086
	Parents of Children that Self-Injured	630.528		
musculoskeletal	Parents of Children that Did Not Self-Injure	578.235	-0.245	0.807
	Parents of Children that Self-Injured	586.509		
congenital abnormalities	Parents of Children that Did Not Self-Injure	580.095	-0.875	0.381
	Parents of Children that Self-Injured	568.252		
Symptoms and ill-defined	Parents of Children that Did Not Self-Injure	579.255	-0.715	0.475
	Parents of Children that Self-Injured	576.500		
Perinatal period	Parents of Children that Did Not Self-Injure	577.920	-0.345	0.730
	Parents of Children that Self-Injured	589.603		
Injury	Parents of Children that Did Not Self-Injure	572.809	-1.981	**0.048**
	Parents of Children that Self-Injured	**639.757**		

APPENDIX D – Kolmogorov-Smirnov Tests of Normality and Mann-Whitney U Tests for MSP Parental Specialty Type Data

Table D1. *Results of the Kolmogorov-Smirnov Tests of Normality as Applied to the Frequency of MSP Health Care Specialty Types Visited per Parent of Youth Data.*

	Self-Injury	Kolmogorov-Smirnov(a)		
		Statistic	df	Sig.
General_Practice	Parents of Children that Did Not Self-injure	.140	1050	.000
	Parents of Children that Self-Injured	.143	107	.000
Dermatology	Parents of Children that Did Not Self-injure	.390	1050	.000
	Parents of Children that Self-Injured	.407	107	.000
Neurology	Parents of Children that Did Not Self-injure	.430	1050	.000
	Parents of Children that Self-Injured	.429	107	.000
Pyschiatry	Parents of Children that Did Not Self-Injure	.456	1050	.000
	Parents of Children that Self-Injured	.446	107	.000
Neuropsychiatry	Parents of Children that Did Not Self-injure	.523	1050	.000
Obstetrics_and_Gynecology	Parents of Children that Did Not Self-injure	.463	1050	.000
	Parents of Children that Self-Injured	.482	107	.000
Ophthalmology	Parents of Children that Did Not Self-injure	.349	1050	.000
	Parents of Children that Self-Injured	.390	107	.000
Otolaryngology	Parents of Children that Did Not Self-injure	.367	1050	.000
	Parents of Children that Self-Injured	.390	107	.000
General_Surgery	Parents of Children that Did Not Self-injure	.320	1050	.000
	Parents of Children that Self-Injured	.359	107	.000

Neurosurgery	Parents of Children that Did Not Self-Injure	.500	1050	.000
	Parents of Children that Self-Injured	.504	107	.000
Orthopaedic_Surgery	Parents of Children that Did Not Self-Injure	.404	1050	.000
	Parents of Children that Self-Injured	.367	107	.000
Plastic_Surgery	Parents of Children that Did Not Self-Injure	.474	1050	.000
	Parents of Children that Self-Injured	.444	107	.000
Cardio_and_Thoracic_Surgery	Parents of Children that Did Not Self-Injure	.518	1050	.000
	Parents of Children that Self-Injured	.508	107	.000
Urology	Parents of Children that Did Not Self-Injure	.422	1050	.000
	Parents of Children that Self-Injured	.439	107	.000
Paediatrics	Parents of Children that Did Not Self-Injure	.524	1050	.000
	Parents of Children that Self-Injured	.537	107	.000
Internal_Medicine	Parents of Children that Did Not Self-Injure	.342	1050	.000
	Parents of Children that Self-Injured	.408	107	.000
Radiology	Parents of Children that Did Not Self-Injure	.168	1050	.000
	Parents of Children that Self-Injured	.152	107	.000
Pathology	Parents of Children that Did Not Self-Injure	.345	1050	.000
	Parents of Children that Self-Injured	.294	107	.000
Anasthesia	Parents of Children that Did Not Self-Injure	.318	1050	.000
	Parents of Children that Self-Injured	.310	107	.000
Physical_Medicine_and_Rehab	Parents of Children that Did Not Self-Injure	.515	1050	.000
	Parents of Children that Self-Injured	.523	107	.000

Public_Health	Parents of Children that Did Not Self-Injure	.524	1050	.000
	Parents of Children that Self-Injured	.535	107	.000
Geriatric_Medicine	Parents of Children that Did Not Self-Injure	.511	1050	.000
Emergency_Medicine	Parents of Children that Did Not Self-Injure	.443	1050	.000
	Parents of Children that Self-Injured	.463	107	.000
Medical_Microbiology	Parents of Children that Did Not Self-Injure	.381	1050	.000
	Parents of Children that Self-Injured	.305	107	.000
Chiropractor	Parents of Children that Did Not Self-Injure	.312	1050	.000
	Parents of Children that Self-Injured	.301	107	.000
Naturopathy	Parents of Children that Did Not Self-Injure	.474	1050	.000
	Parents of Children that Self-Injured	.523	107	.000
Physical_Therapy	Parents of Children that Did Not Self-Injure	.337	1050	.000
	Parents of Children that Self-Injured	.306	107	.000
Nuclear_Medicine	Parents of Children that Did Not Self-Injure	.392	1050	.000
	Parents of Children that Self-Injured	.407	107	.000
Osteopathy	Parents of Children that Did Not Self-Injure	.511	1050	.000
Oral_Surgery	Parents of Children that Did Not Self-Injure	.523	1050	.000
Podiatry	Parents of Children that Did Not Self-Injure	.436	1050	.000
	Parents of Children that Self-Injured	.442	107	.000
Optometry	Parents of Children that Did Not Self-Injure	.188	1050	.000
	Parents of Children that Self-Injured	.219	107	.000
Dental_Surgery	Parents of Children that Did Not Self-Injure	.525	1050	.000
	Parents of Children that Self-Injured	.529	107	.000

Massage_Therapy	Parents of Children that Did Not Self-Injure	.427	1050	.000
	Parents of Children that Self-Injured	.388	107	.000
Rheumatology	Parents of Children that Did Not Self-Injure	.515	1050	.000
	Parents of Children that Self-Injured	.517	107	.000
Vascular_Surgery	Parents of Children that Did Not Self-Injure	.519	1050	.000
	Parents of Children that Self-Injured	.529	107	.000
BC_Reciprocal_Claims	Parents of Children that Did Not Self-Injure	.533	1050	.000
Out_of_Country_Practitioner	Parents of Children that Did Not Self-Injure	.508	1050	.000
	Parents of Children that Self-Injured	.529	107	.000

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Table D2. *Results of the Mann-Whitney U Tests Applied to the Difference in Frequency of MSP Health Care Specialty Types Visited by Parents of Individuals that Did and Did Not Self-Injure.*

MSP Health Care Provider Type	Group	Mean Rank	Z	p-value
General Practice	Parents of Children that Did Not Self-Injure	575.246	-1.197	0.231
	Parents of Children that Self-Injured	615.841		
Dermatology	Parents of Children that Did Not Self-Injure	579.460	-0.197	0.844
	Parents of Children that Self-Injured	574.491		
Neurology	Parents of Children that Did Not Self-Injure	578.540	-0.208	0.835
	Parents of Children that Self-Injured	583.509		
Psychiatry	Parents of Children that Did Not Self-Injure	576.679	-1.291	0.197
	Parents of Children that Self-Injured	601.776		
Neuropsychiatry	Parents of Children that Did Not Self-Injure	579.306	-0.784	0.433
.	Parents of Children that Self-Injured	576.000		
Obstetrics and Gynecology	Parents of Children that Did Not Self-Injure	578.501	-0.329	0.742
	Parents of Children that Self-Injured	583.893		
Ophthalmology	Parents of Children that Did Not Self-Injure	577.628	-0.473	0.636
	Parents of Children that Self-Injured	592.467		
Otolaryngology	Parents of Children that Did Not Self-Injure	580.898	-0.771	0.441
	Parents of Children that Self-Injured	560.374		
General Surgery	Parents of Children that Did Not Self-Injure	578.986	-0.005	0.996
	Parents of Children that Self-Injured	579.136		

Neurosurgery	Parents of Children that Did Not Self-Injure	578.301	-0.493	0.622
	Parents of Children that Self-Injured	585.855		
Orthopaedic Surgery	Parents of Children that Did Not Self-Injure	576.370	-1.115	0.265
	Parents of Children that Self-Injured	604.808		
Plastic Surgery	Parents of Children that Did Not Self-Injure	580.184	-0.621	0.534
	Parents of Children that Self-Injured	567.379		
Urology	Parents of Children that Did Not Self-Injure	576.883	-1.680	0.093
	Parents of Children that Self-Injured	599.776		
Paediatrics	Parents of Children that Did Not Self-Injure	574.854	-1.702	0.089
	Parents of Children that Self-Injured	619.687		
Internal Medicine	Parents of Children that Did Not Self-Injure	578.752	-0.297	0.766
	Parents of Children that Self-Injured	581.435		
Radiology	Parents of Children that Did Not Self-Injure	581.490	-0.804	0.421
	Parents of Children that Self-Injured	554.561		
Cardio and Thoracic Surgery	Parents of Children that Did Not Self-Injure	577.127	-0.599	0.549
	Parents of Children that Self-Injured	597.383		
Pathology	Parents of Children that Did Not Self-Injure	577.311	-0.539	0.590
	Parents of Children that Self-Injured	595.570		
Anaesthesia	Parents of Children that Did Not Self-Injure	578.357	-0.229	0.819
	Parents of Children that Self-Injured	585.308		
Paediatric Cardiology	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		

Physical Medicine and Rehab	Parents of Children that Did Not Self-Injure	577.985	-0.878	0.380
	Parents of Children that Self-Injured	588.963		
Public Health	Parents of Children that Did Not Self-Injure	578.009	-1.732	0.083
	Parents of Children that Self-Injured	588.729		
Occupational Medicine	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Geriatric Medicine	Parents of Children that Did Not Self-Injure	579.051	-0.319	0.750
	Parents of Children that Self-Injured	578.500		
Emergency Medicine	Parents of Children that Did Not Self-Injure	580.041	-0.496	0.620
	Parents of Children that Self-Injured	568.785		
Medical Microbiology	Parents of Children that Did Not Self-Injure	577.254	-0.633	0.527
	Parents of Children that Self-Injured	596.131		
Chiropractor	Parents of Children that Did Not Self-Injure	578.915	-0.030	0.976
	Parents of Children that Self-Injured	579.836		
Naturopathy	**Parents of Children that Did Not Self-Injure**	**582.168**	-2.019	**0.044**
	Parents of Children that Self-Injured	547.916		
Physical Therapy	Parents of Children that Did Not Self-Injure	576.376	-0.912	0.362
	Parents of Children that Self-Injured	604.752		
Nuclear Medicine	Parents of Children that Did Not Self-Injure	579.278	-0.119	0.905
	Parents of Children that Self-Injured	576.271		
Osteopathy	Parents of Children that Did Not Self-Injure	579.051	-0.319	0.750
	Parents of Children that Self-Injured	578.500		

Oral Surgery	Parents of Children that Did Not Self-Injure	579.357	-0.847	0.397
	Parents of Children that Self-Injured	575.500		
Podiatry	Parents of Children that Did Not Self-Injure	576.651	-1.199	0.231
	Parents of Children that Self-Injured	602.051		
Optometry	Parents of Children that Did Not Self-Injure	581.755	-0.898	0.369
	Parents of Children that Self-Injured	551.963		
Dental Surgery	Parents of Children that Did Not Self-Injure	578.955	-0.089	0.929
	Parents of Children that Self-Injured	579.439		
Oral Medicine	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Orthodontia	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Massage Therapy	Parents of Children that Did Not Self-Injure	573.793	-2.530	**0.011**
	Parents of Children that Self-Injured	**630.093**		
Rheumatology	Parents of Children that Did Not Self-Injure	577.973	-1.119	0.263
	Parents of Children that Self-Injured	589.075		
Clinical Immunization and Allergy	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Medical Genetics	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Vascular Surgery	Parents of Children that Did Not Self-Injure	578.807	-0.458	0.647
	Parents of Children that Self-Injured	580.893		

Thoracic Surgery	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Midwives of BC	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Registered Nurse	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Nutritionist or Dietitian	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Counsellor	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Educator	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Licensed Practical Nurse	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Medical Office Assistance	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Nurse Practitioner	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Respiratory Therapist	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Home Support	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		

Pharmacist	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Out of Country Practitioner	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		

APPENDIX E – Kolmogorov-Smirnov Tests of Normality and Mann-Whitney U Tests for Parental MSP Service Type Data

Table E1. *Results of the Kolmogorov-Smirnov Tests of Normality as Applied to the Frequency of MSP Service Types Received per Subject Data.*

	Self-Injury	Kolmogorov-Smirnov(a)		
		Statistic	df	Sig.
GP Regional Examinations	Parents of Children that Did Not Self-Injure	.256	1050	.000
	Parents of Children that Self-Injured	.288	107	.000
GP Complete Examinations	Parents of Children that Did Not Self-Injure	.444	1050	.000
	Parents of Children that Self-Injured	.430	107	.000
GP Counselling	Parents of Children that Did Not Self-Injure	.428	1050	.000
	Parents of Children that Self-Injured	.381	107	.000
GP Home Visits	Parents of Children that Did Not Self-Injure	.523	1050	.000
	Parents of Children that Self-Injured	.529	107	.000
GP Emergency Visits	Parents of Children that Did Not Self-Injure	.497	1050	.000
	Parents of Children that Self-Injured	.474	107	.000
GP Institutional Visits	Parents of Children that Did Not Self-Injure	.521	1050	.000
	Parents of Children that Self-Injured	.533	107	.000
GP Miscellaneous and Other	Parents of Children that Did Not Self-Injure	.516	1050	.000
GP Visit Premiums	Parents of Children that Did Not Self-Injure	.525	1050	.000
	Parents of Children that Self-Injured	.532	107	.000
GP No Charge Referral	Parents of Children that Did Not Self-Injure	.452	1050	.000
	Parents of Children that Self-Injured	.483	107	.000

Specialist Consultation	Parents of Children that Did Not Self-Injure	.390	1050	.000
	Parents of Children that Self-Injured	.369	107	.000
Specialist Subsequent Visits	Parents of Children that Did Not Self-Injure	.471	1050	.000
	Parents of Children that Self-Injured	.511	107	.000
Specialist Counselling and Psychotherapy	Parents of Children that Did Not Self-Injure	.511	1050	.000
	Parents of Children that Self-Injured	.533	107	.000
Specialist Emergency Visits	Parents of Children that Did Not Self-Injure	.530	1050	.000
	Parents of Children that Self-Injured	.529	107	.000
Specialist Institutional Visits	Parents of Children that Did Not Self-Injure	.517	1050	.000
	Parents of Children that Self-Injured	.533	107	.000
Specialist Miscellaneous and Others	Parents of Children that Did Not Self-Injure	.511	1050	.000
Specialist Critical Care Services	Parents of Children that Did Not Self-Injure	.511	1050	.000
Anasethesia	Parents of Children that Did Not Self-Injure	.515	1050	.000
	Parents of Children that Self-Injured	.534	107	.000
Cardiovascular Surgery	Parents of Children that Did Not Self-Injure	.511	1050	.000
Obstetrics	Parents of Children that Did Not Self-Injure	.513	1050	.000
Surgery	Parents of Children that Did Not Self-Injure	.504	1050	.000
	Parents of Children that Self-Injured	.514	107	.000
Minor Surgery	Parents of Children that Did Not Self-Injure	.459	1050	.000
	Parents of Children that Self-Injured	.510	107	.000
Dialysis or Transfusions	Parents of Children that Did Not Self-Injure	.511	1050	.000
General Services	Parents of Children that Did Not Self-Injure	.498	1050	.000
	Parents of Children that Self-Injured	.536	107	.000

Procedural Premiums	Parents of Children that Did Not Self-Injure	.527	1050	.000
	Parents of Children that Self-Injured	.529	107	.000
Diagnostic Radiology	Parents of Children that Did Not Self-Injure	.351	1050	.000
	Parents of Children that Self-Injured	.387	107	.000
Diagnostic Ultrasound	Parents of Children that Did Not Self-Injure	.527	1050	.000
	Parents of Children that Self-Injured	.530	107	.000
Nuclear Medicine	Parents of Children that Did Not Self-Injure	.532	1050	.000
	Parents of Children that Self-Injured	.530	107	.000
Pathology Category 1	Parents of Children that Did Not Self-Injure	.321	1050	.000
	Parents of Children that Self-Injured	.312	107	.000
Pathology Beyond Category 1	Parents of Children that Did Not Self-Injure	.375	1050	.000
	Parents of Children that Self-Injured	.304	107	.000
Pulmonary Function	Parents of Children that Did Not Self-Injure	.528	1050	.000
	Parents of Children that Self-Injured	.529	107	.000
Electrodiagnosis	Parents of Children that Did Not Self-Injure	.479	1050	.000
	Parents of Children that Self-Injured	.489	107	.000
Procedural Cardiology	Parents of Children that Did Not Self-Injure	.517	1050	.000
Other	Parents of Children that Did Not Self-Injure	.431	1050	.000
	Parents of Children that Self-Injured	.427	107	.000
GP Consultation	Parents of Children that Did Not Self-Injure	.534	1050	.000
	Parents of Children that Self-Injured	.536	107	.000

a Lilliefors Significance Correction

Table E2. *Results of the Mann-Whitney U Tests Applied to the Difference in Frequency of MSP Health Care Services Received by the Parents of Children that Did and Did Not Self-Injure.*

Service Type	Group	Mean Rank	Z	p-value
GP Regional Examinations	Parents of Children that Did Not Self-Injure	578.670	-0.106	0.916
	Parents of Children that Self-Injured	582.238		
GP Consultation	Parents of Children that Did Not Self-Injure	578.083	-0.376	0.707
	Parents of Children that Self-Injured	588.000		
GP Complete Examiniations	Parents of Children that Did Not Self-Injure	578.418	-0.253	0.800
	Parents of Children that Self-Injured	584.710		
GP Counselling	Parents of Children that Did Not Self-Injure	578.858	-0.315	0.753
	Parents of Children that Self-Injured	580.393		
GP Emergency Visits	Parents of Children that Did Not Self-Injure	575.503	-1.982	**0.047**
	Parents of Children that Self-Injured	**613.313**		
GP Home Visits	Parents of Children that Did Not Self-Injure	578.656	-0.290	0.772
	Parents of Children that Self-Injured	582.379		
GP Institutional Visits	Parents of Children that Did Not Self-Injure	579.153	-0.553	0.580
	Parents of Children that Self-Injured	577.500		
GP Miscellaneous and Other	Parents of Children that Did Not Self-Injure	578.511	-0.388	0.698
	Parents of Children that Self-Injured	583.794		

GP Visit Premiums	Parents of Children that Did Not Self-Injure	579.992	-0.450	0.652
	Parents of Children that Self-Injured	569.266		
GP No Charge Referral	Parents of Children that Did Not Self-Injure	578.075	-0.362	0.717
	Parents of Children that Self-Injured	588.075		
Specialist Consultation	Parents of Children that Did Not Self-Injure	579.309	-0.176	0.860
	Parents of Children that Self-Injured	575.967		
Specialist Subsequent Visits	Parents of Children that Did Not Self-Injure	579.648	-0.617	0.537
	Parents of Children that Self-Injured	572.640		
Specialist Counselling Psychotherapy	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Specialist Home Visits	Parents of Children that Did Not Self-Injure	579.156	-0.263	0.793
	Parents of Children that Self-Injured	577.467		
Specialist Emergency Visits	Parents of Children that Did Not Self-Injure	579.023	-0.026	0.979
	Parents of Children that Self-Injured	578.771		
Specialist Institutional Visits	Parents of Children that Did Not Self-Injure	579.051	-0.319	0.750
	Parents of Children that Self-Injured	578.500		
Specialist Miscellaneous and Other	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Specialist Visit Premiums	Parents of Children that Did Not Self-Injure	579.051	-0.319	0.750
	Parents of Children that Self-Injured	578.500		

Specialist Critical Care Services	Parents of Children that Did Not Self-Injure	579.511	-0.359	0.720
	Parents of Children that Self-Injured	573.981		
Anaesthesia	Parents of Children that Did Not Self-Injure	579.051	-0.319	0.750
	Parents of Children that Self-Injured	578.500		
Cardiovascular Surgery	Parents of Children that Did Not Self-Injure	579.102	-0.452	0.652
	Parents of Children that Self-Injured	578.000		
Obstetrics	Parents of Children that Did Not Self-Injure	579.165	-0.098	0.922
	Parents of Children that Self-Injured	577.383		
Surgery	Parents of Children that Did Not Self-Injure	579.066	-0.038	0.970
	Parents of Children that Self-Injured	578.355		
Minor Surgery and Therapeutic Procedures		579.000	0.000	1.000
	Parents of Children that Did Not Self-Injure			
	Parents of Children that Self-Injured	579.000		
Unlisted Misecellaneous Surgery		579.102	-0.452	0.652
	Parents of Children that Did Not Self-Injure			
	Parents of Children that Self-Injured	578.000		
Dialysis and Transfusions	Parents of Children that Did Not Self-Injure	579.332	-0.301	0.764
	Parents of Children that Self-Injured	575.738		
General Services	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Therapeutic Radiation	Parents of Children that Did Not Self-Injure	578.908	-0.194	0.846
	Parents of Children that Self-Injured	579.907		

Procedural Premiums	Parents of Children that Did Not Self-Injure	581.036	-0.772	0.440
	Parents of Children that Self-Injured	559.023		
Diagnostic Ophthalmology	Parents of Children that Did Not Self-Injure	578.607	-0.289	0.773
	Parents of Children that Self-Injured	582.860		
Diagnostic Radiology	Parents of Children that Did Not Self-Injure	578.918	-0.116	0.908
	Parents of Children that Self-Injured	579.804		
Diagnostic Ultrasound	Parents of Children that Did Not Self-Injure	578.912	-0.032	0.975
	Parents of Children that Self-Injured	579.860		
Nuclear Medicine	Parents of Children that Did Not Self-Injure	579.170	-0.059	0.953
	Parents of Children that Self-Injured	577.327		
Pathology Category 1	Parents of Children that Did Not Self-Injure	579.411	-0.596	0.551
	Parents of Children that Self-Injured	574.963		
Pathology Beyond Category 1	Parents of Children that Did Not Self-Injure	579.940	-0.472	0.637
	Parents of Children that Self-Injured	569.780		
Pulmonary Function	Parents of Children that Did Not Self-Injure	579.306	-0.784	0.433
	Parents of Children that Self-Injured	576.000		
Electrodiagnosis	Parents of Children that Did Not Self-Injure	580.730	-0.796	0.426
	Parents of Children that Self-Injured	562.028		
Procedural Cardiology	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		
Other	Parents of Children that Did Not Self-Injure	579.000	0.000	1.000
	Parents of Children that Self-Injured	579.000		

Diagnostic Premiums	Parents of Children that Did Not Self-Injure	578.466	-0.590	0.555
	Parents of Children that Self-Injured	584.238		

APPENDIX F – Logistic Regression Analysis of Risk Factors for Self Injury Among Depressed Youth Under the Age of 25 Years in British Columbia

Table F1. *Logistic Regression Statistics for the Univariate Predictors of Self-Injury, $\alpha=0.05$.*

Variable	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
sex=F	7.635545	**0.005723**	0.778469	0.651778	0.929787
sex=M (reference)	.	.	.	.	.
Percentage of Aboriginals in HSDA=Low	20.80289	**5.09E-06**	1.50201	1.26111	1.788928
Percentage of Aboriginals in HSDA=Medium	14.00481	**0.000182**	1.397718	1.172894	1.665637
Percentage of Aboriginals in HSDA=High (reference)	.	.	.	.	.
Average Income of Census Families=Low	14.8296	**0.000118**	0.705475	0.590698	0.842555
Average Income of Census Families=Medium	8.910434	**0.002835**	0.755578	0.628576	0.90824
Average Income of Census Families=High (reference)	.	.	.	.	.
Average Income of Female Lone Parents=Low	36.80197	**1.31E-09**	0.574509	0.48032	0.68717
Average Income of Female Lone Parents=Medium	4.277317	**0.038624**	0.819294	0.678279	0.989626
Average Income of Female Lone Parents=High (reference)	.	.	.	.	.
Population=Low	16.52121	**4.81E-05**	0.685705	0.57164	0.82253
Population=Medium	10.57824	**0.001144**	0.741771	0.619572	0.88807
Population=High (reference)	.	.	.	.	.
Population Density=Low	30.74906	**2.94E-08**	0.604739	0.506247	0.722393
Population Density=Medium	1.764015	0.184124	0.88047	0.729676	1.062427
Population Density=High(reference)	.	.	.	.	.
Post Secondary Qualifications=Low	9.885357	**0.001666**	0.751691	0.629166	0.898078
Post Secondary Qualifications=Medium	1.918672	0.166003	0.879343	0.733067	1.054806
Post Secondary Qualifications=High (reference)	.	.	.	.	.

Percentage of Single Parent Families=Low	13.86405	**0.000197**	1.382114	1.165638	1.638792
Percentage of Single Parent Families=Medium	25.3902	**4.68E-07**	1.608408	1.336948	1.934987
Percentage of Single Parent Families=High (reference)					

Variable	Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B) Lower Bound	Upper Bound
Percentage of Visible Minorites in HSDA=Low	35.40162	**2.68E-09**	0.575099	0.479292	0.690059
Percentage of Visible Minorites in HSDA=Medium	11.39912	**0.000735**	0.715292	0.588855	0.868876
Percentage of Visible Minorites in HSDA=High (reference)	.	.	.	.	.
Lin Age	10.39885	**0.001261**	0.675462	0.532149	0.85737
Infection	150.2918	**1.5E-34**	0.987139	0.985098	0.989184
Neoplasm	0.061827	0.803631	1.005077	0.965747	1.046008
Lin Endocrine	20.54463	**5.83E-06**	0.828539	0.763818	0.898743
Lin Blood Diseases	13.98419	**0.000184**	0.759034	0.656907	0.877038
Lin Mental Disorders	443.8319	**1.59E-98**	0.41944	0.386871	0.454752
Lin Nervous System	32.34137	**1.29E-08**	0.781608	0.717973	0.850882
Lin Circulatory	37.78374	**7.9E-10**	0.752519	0.687297	0.823931
Respiratory	26.29774	**2.93E-07**	0.992103	0.989101	0.995114
Lin Digestive	122.629	**1.68E-28**	0.660155	0.613373	0.710505
Lin Genitourinary	29.8817	**4.59E-08**	0.851127	0.80333	0.901767
Pregnancy	0.116412	0.732959	0.999432	0.996175	1.0027
Lin Skin	14.28135	**0.000157**	0.866651	0.804651	0.933427
Lin Musculoskeletal	4.169303	**0.041163**	0.952197	0.908463	0.998037
Congenital Abnormalities	0.264527	0.607027	0.990188	0.95367	1.028104

Perinatal Period	0.136889	0.711394	0.99176	0.949228	1.036198
Lin Symptoms and Ill-defined	130.7793	**2.77E-30**	0.61345	0.564166	0.667039
Lin Injury	165.7913	**6.14E-38**	0.647475	0.606021	0.691765

Table F2. *Results of the Box-Tidwell Analysis for Linearity of the Logit (α=0.00135).*

Likelihood Ratio Tests

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	4270.320(a)	.000	0	.
Age	4355.600	85.280	1	.000
Infection	4283.679	13.358	1	.000
Endocrine	4275.237	4.917	1	.027
Blood diseases	4272.824	2.504	1	.114
Mental disorders	4272.557	2.237	1	.135
Nervous system	4270.403	.083	1	.773
Circulatory	4270.470	.150	1	.699
Respiratory	4270.923	.603	1	.437
Digestive	4270.329	.009	1	.923
Genitourinary	4273.112	2.792	1	.095
Skin	4271.818	1.498	1	.221
Musculoskeletal	4273.217	2.897	1	.089
Symptoms and ill-defined	4270.783	.463	1	.496
Injury	4288.360	18.040	1	.000
Lin age	4348.585	78.265	1	**.000**
Lin infection	4277.800	7.480	1	.006
Lin endocrine	4272.603	2.283	1	.131
Lin blood diseases	4271.497	1.177	1	.278
Lin mental disorders	4364.891	94.571	1	**.000**
Lin nervous system	4271.399	1.079	1	.299
Lin circulatory	4270.400	.080	1	.777
Lin respiratory	4273.410	3.090	1	.079
Lin digestive	4279.373	9.053	1	.003
Lin genitourinary	4270.465	.145	1	.703
Lin skin	4272.960	2.640	1	.104

Lin musculoskeletal	4285.579	15.259	1	**.000**
Lin symptoms and ill-defined	4273.085	2.765	1	.096
Lin injury	4400.886	130.566	1	**.000**
Sex	4274.638	4.318	1	.038
Percentage of Aboriginals in HSDA	4273.042	2.722	2	.256
Average Income of Census Families	4276.566	6.246	2	.044
Average Income of Female Lone Parents	4283.039	12.719	2	.002
Population	4278.261	7.941	2	.019
Population density	4277.153	6.833	2	.033
Post Secondary Qualifications	4273.402	3.082	2	.214
Percentage of Single Parent Families	4270.557	.237	2	.888
Percentage of Visible Minorites in HSDA	4281.895	11.575	2	.003

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Table F3. *Logistic Regression Coeffecients, Wald Statistics, Odds Ratios and 95% Confidence Intervals for Odds Ratios for 23 Predictors of Self-Injury (α=0.00227).*

Presence of Self-Injury(a)		Wald	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
					Lower Bound	Upper Bound
.00	Intercept	191.088	.000			
	lin_age	.170	.680	1.057	.811	1.378
	infection	5.514	.019	.996	.993	.999
	endocrine	1.884	.170	.994	.987	1.002
	blood_diseases	.998	.318	.983	.951	1.017
	lin_mental_disorders	318.981	.000	.441	.403	.482
	nervous_system	1.328	.249	1.003	.998	1.009
	circulatory	.665	.415	.993	.976	1.010
	respiratory	9.882	.002	1.007	1.002	1.011
	digestive	3.544	.060	.991	.982	1.000
	genitourinary	.467	.494	1.002	.997	1.006
	skin	.021	.886	1.000	.993	1.006
	lin_musculoskeletal	56.528	.000	1.293	1.209	1.383
	symptoms_and_illdefined	.163	.687	.999	.997	1.002
	lin_injury	125.208	.000	.586	.534	.644
	[sex=F]	6.930	.008	.753	.609	.930
	[sex=M]	.	.	.	.	.
	[Percentage_of_Aboriginals_in_HSDA=1.00]	2.835	.092	.628	.365	1.079
	[Percentage_of_Aboriginals_in_HSDA=2.00]	.000	.999	1.000	.750	1.332
	[Percentage_of_Aboriginals_in_HSDA=3.00]	.	.	.	.	.
	[Average_Income_of_Census_Families=1.00]	2.239	.135	1.457	.890	2.386
	[Average_Income_of_Census_Families=2.00]	.619	.431	1.210	.752	1.948
	[Average_Income_of_Census_Families=3.00]	.	.	.	.	.
	[Average_Income_of_Female_Lone_Parents=1.00]	14.271	.000	.300	.161	.561
	[Average_Income_of_Female_Lone_Parents=2.00]	2.927	.087	.709	.477	1.051

[Average_Income_of_Female_Lone_Parents=3.00]	.	.	.	.	.
[population_density=1.00]	.001	.976	.993	.617	1.598
[population_density=2.00]	4.602	.032	1.901	1.057	3.419
[population_density=3.00]	.	.	.	.	.
[post_secondary_qualifications=1.00]	5.480	.019	1.984	1.118	3.521
[post_secondary_qualifications=2.00]	3.242	.072	1.632	.958	2.782
[post_secondary_qualifications=3.00]	.	.	.	.	.
[Percentage_of_Single_Parent_Families=1.00]	1.577	.209	.776	.522	1.153
[Percentage_of_Single_Parent_Families=2.00]	.152	.697	1.054	.809	1.374
[Percentage_of_Single_Parent_Families=3.00]	.	.	.	.	.
[Percentage_of_Visible_Minorites_in_HSDA=1.00]	3.348	.067	.667	.432	1.029
[Percentage_of_Visible_Minorites_in_HSDA=2.00]	10.267	.001	.492	.318	.759
[Percentage_of_Visible_Minorites_in_HSDA=3.00]	.	.	.	.	.

a The reference category is: 1.00.
b This parameter is set to zero because it is redundant.